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(54) **CATV terminal and video apparatus having a noise eliminating circuit.**

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Description

The present invention relates to a CATV terminal used for a CATV system in which a large number of terminals are connected with a center for the transmission of television signals from the center to the terminals. The present invention also relates to video equipment such as a video cassette recorder (VCR), video disk player (VDP) and television receiver.

Generally, a CATV system is constructed to transmit the programs produced in the center and on-air programs to the terminals by way of cables.

In such a CATV system, trunk line amplifiers are incorporated at approximately twenty stages into one trunk line for the transmission of programs to the terminals, and, additionally, line amplifiers are incorporated at two or three stages after the transmission line is branched off from the trunk line. As a result, the terminal equipment at the farthest end of the line receives signals affected by the influence of noise factors (NF) in the amplifiers thus connected to form twenty or more stages on the line.

Moreover, in the CATV system, some of the programs produced in the center are made chargeable, and viewers at the terminals are charged predetermined charges for the reception of those programs.

Therefore, a scrambling operation is performed at the center, which disorganizes television signals so that the chargeable programs cannot be received in a normal condition with an ordinary television reciever, i.e., to prevent the unauthorized reception.

A descrambling means for restoring the scrambled signals to the original signals is incorporated in the CATV terminal of the subscribers who have been permitted to receive the chargeable programs.

Various kinds of systems have hitherto been proposed for such scrambling and descrambling systems. For example, there is a system called the GSS (Gated Sync Suppression) system, in which only the horizontal synchronizing signal portions and the vertical synchronizing signal portions of a video signal are compressed by several decibels to form a scrambled signal so that the horizontal and vertical synchronization cannot be detected by an ordinary television receiver, while the horizontal and vertical synchronizing signal portions of the video signal, so scrambled by their compression by several decibels, can be expanded to the original level at the side of the terminals authorized to receive the chargeable programs. There is another system generally known as the SSS (Sine Sync Suppression) system, in which a video IF signal is AM-modulated (scrambled) with a sine wave in synchronism with the horizontal synchronizing signal, and at the terminal side the transmitted signal is restored to its original signal by AM-demodulating (descrambling) the video IF signal with a sine wave in the reverse phase.

Figs. 1(a) through 1(e) illustrate the manner in which the scrambling process and the descrambling process are performed by the GSS system mentioned above.

Fig. 1(a) shows an ordinary baseband video signal, and H in the figure represents a horizontal synchronizing signal. Fig. 1(b) shows a state of this video signal as modulated into an intermediate frequency video signal Fv. This intermediate frequency video signal Fv is processed at the transmitting side, i.e., the center, for the compression of the horizontal synchronizing signal portion by, for example, 6 dB or 10 dB, as illustrated in Fig. 1(c).

This compressed portion corresponds to a horizontal blanking interval (HBI) containing the horizontal synchronizing signal H and the color burst signal Cb, and has a period (t_1) of, for example, 12 μsec. And, in the center, a key signal indicating the compression timing is superimposed on an audio FM signal (not illustrated in the figure) and modulated, together with the intermediate frequency video signal Fv, into an RF signal which is transmitted to the terminals.

The terminal equipment, which exists inside the home, extracts the audio FM signal from the received RF signal and then detects the key signal mentioned above in this audio signal. Then, on the basis of the key signal thus detected, the terminal equipment restores the received video signal to their original state by expanding the horizontal synchronizing signal portions and the vertical synchronizing signal portions by approximately 6 dB or 10 dB in correspondence with the compression rate.

The period (t_2) in which the terminal equipment expands the video signal is set at a period somewhat narrower than that of the compression; for example, 10 μsec. This is to ensure the stability of the descrambling circuit and to prevent partial omission of the picture signal portion.

With this setup, the intermediate frequency video signal Fv will be as shown in Fig. 1(d).

The intermediate frequency video signal Fv which has thus been restored in the terminal equipment is processed by AM detection, which converts it into the baseband signal as illustrated in Fig. 1(e). Thereafter, this baseband video signal is subjected to such processes as volume control of the audio signal and superposition onto the video signal, and the resultant signal is modulated again and sent out to the television receiver in the home.

As described above, the terminal equipment in a CATV system receives the video signal affected by the influence of noise factors (NF) of many amplifiers incorporated into the transmission line from the center to the terminal equipment, so that noises are superimposed on the video signal so received and the signal to noise (S/N) ratio of the video signal is thereby deteriorated.

Moreover, at the time of the scrambling operation

of the GSS system at the transmitting side, the HBI portion of the intermediate frequency video signal Fv which contains the horizontal synchronizing signal H and the color burst signal Cb is compressed, and, in the descrambling operation of the GSS system at the side of the terminal equipment which receives the compressed signals via the transmission line, the HBI portion of the signal Fv which contains the horizontal synchronizing signal H and the color burst signal Cb is expanded in a manner reverse to the transmitting side. In such an expanding process, the noises in the HBI portion are also expanded, so that the noises on such a portion increase more in comparison with the picture signal portion so that the S/N ratio in the HBI portion is deteriorated by the rate of the expansion, that is, by 6 dB or 10 dB.

Presently, television receivers are in general provided with an AGC circuit for controlling the amplification gain of the receiver in accordance with the voltage for judging the strength of an input radio wave which voltage is generated from the detected composite television signal, lest a change should occur in the contrast of pictures on the screen even if fluctuations occur in the radio wave induced on the antenna by the fading effect, etc. The television receivers as used at present are provided with two kinds of AGC circuits, one being the peak AGC circuit and the other being the keyed AGC circuit.

The peak AGC circuit is a circuit designed to obtain the AGC voltage from the peak value of the synchronizing signal, utilizing the fact that the synchronizing signal level which marks the peak value in the direction of black of the composite television signal maintains a certain constant value provided that intensity of the radio wave in reception remains constant. In practice, a noise eliminating circuit is provided at the preceding stage, lest a change should occur in the gain because of noises mixed into the signal and having an amplitude equal to or in excess of that of the synchronizing signal. For example, the circuit illustrated in Fig. 2 is employed.

On the other hand, the keyed AGC circuit mentioned above is designed to extract and detect only the horizontal synchronizing signal of the composite television signal and to use this detected voltage as the control voltage signal, and, as such, it is not susceptible to the influence of the noises mixed into the composite television signal. The circuit illustrated in Fig. 3, for example, is used.

As it is evident from the illustrated circuits, a capacitor C is used in either type of the AGC circuits to generate the voltage corresponding to the level of the synchronizing signal, and the capacitor C is required to have a capacitance large enough to generate the voltage corresponding to the level of the synchronizing signal even when it is at the maximum level.

Because of this construction, the charging voltage of the capacitor C will change as shown in Fig. 4 under the influence of the large noise which, as described above, is superimposed on the synchronizing signal portion of the video signal in the process of the signal transmission via the cable or in the descrambling process, and the AGC voltage in the AGC circuit will be affected thereby. This change of the AGC voltage for each horizontal scanning line results in the fluctuations of the video signal level, which cause luminance fluctuations in the form of fine streaks running in the horizontal direction on the screen of a television receiver and consequently cause a deterioration of the picture quality.

Moreover, in general, the luminance component of the back porch portion is used as a reference for the luminance of television receiver. Therefore, if large noises are included in the back porch portion in the descrambling process as mentioned above, the reference for luminance fluctuates for each horizontal scanning line, which causes the appearance of dark horizontal lines on the screen of a television receiver, thereby causing a deterioration of the picture quality.

In the foregoing, the description has been made in conjunction with the CATV terminal. From now on, the video equipment is solely dealt with, separately from the CATV terminal. A television signal received with a VCR or VDP is sent out ultimately to a television receiver, and pictures are displayed on the screen of the television receiver. The television receiver itself also reproduces on its screen a signal received with its antenna.

Television receivers are in general provided with an AGC circuit for controlling the amplification gain of the receiver in accordance with the voltage for judging the strength of an input radio wave which voltage is generated from the detected composite television signal, lest a change should occur in the luminance level or contrast of pictures on the screen even if fluctuations occur in the radio wave induced on the antenna by the fading effect, etc. The television receivers as used at present are provided with two kinds of AGC circuits, one being the peak AGC circuit and the other being the keyed AGC circuit.

The peak AGC circuit is a circuit designed to obtain the AGC voltage from the peak value of the synchronizing signal, utilizing the fact that the synchronizing signal level which marks the peak value in the direction of black of the composite television signal maintains a certain constant value provided that intensity of the radio wave in reception remains constant. In practice, a noise eliminating circuit is provided at the preceding stage, lest a change should occur in the gain because of noises mixed into the signal and having an amplitude equal to or in excess of that of the synchronizing signal. For example, the circuit illustrated in Fig. 2 is employed.

On the other hand, the keyed AGC circuit mentioned above is designed to extract and detect only the horizontal synchronizing signal of the composite

television signal and to use this detected voltage as the control voltage signal, and, as such, it is not susceptible to the influence of the noises mixed into the composite television signal period. The circuit illustrated in Fig. 3, for example, is used.

Moreover, in general, television receivers employ a circuit commonly known as the pedestal clamping circuit, in which the luminance component of the back porch portion including the color burst signal subsequent to the horizontal synchronizing signal and the portions fore and rear of the color burst signal is used as a reference for the luminance.

As it is evident from the illustrated circuits, a capacitor C is used in either type of the AGC circuits to generate the voltage corresponding to the level of the synchronizing signal, and the capacitor C is required to have a capacitance large enough to generate the voltage corresponding to the level of the synchronizing signal even when it is at the maximum level.

Because of this construction, the charging voltage of the capacitor C will change under the influence of noises as shown in Fig. 4 if the noises are included in the synchronizing signal portion of the video signal produced by demodulating the broadcast wave received with a television receiver, and the AGC voltage in the AGC circuit will be affected thereby. This change in the AGC voltage results in the deterioration of the picture quality because they cause luminance fluctuations in the form of fine streaks running in the horizontal direction on the screen of a television receiver.

Moreover, if large noises are included in the back porch portion, the reference for luminance in the pedestal clamping circuit is fluctuated by the noises, and such fluctuations result in the appearance of dark lateral horizontal lines on the screen of a television receiver, thereby causing a deterioration of the picture quality.

Therefore, in view of the problems described above, an object of this invention is to offer a CATV terminal which can eliminate the noises superimposed on a synchronizing signal, lest the picture quality should be deteriorated in consequence of luminance changes in the form of fine streaks in the horizontal direction on a screen because of fluctuations of an AGC voltage in an AGC circuit in a television receiver under the influence of the noises superimposed on the synchronizing signal in the process of transmission of a video signal or in a descrambling process.

Another object of this invention is to offer a CATV terminal which can eliminate the noises present in a back porch portion, lest the picture quality should be deteriorated by dark horizontal streaks appearing on a screen by fluctuations of a reference for luminance of a television receiver which are caused by the noises superimposed on the back porch portion in the process of transmission of a video signal or in a descrambling process.

Another object is to offer a video apparatus which can eliminate the noises superimposed on a synchronizing signal, lest the picture quality should be deteriorated in consequence of luminance changes in the form of fine streaks in the horizontal direction on a screen because of fluctuations of an AGC voltage in an AGC circuit in a television receiver under the influence of the noises superimposed on the synchronizing signal of the video signal.

Further object of this invention is to offer a video apparatus which can eliminate the noises present in a back porch portion, lest the picture quality should be deteriorated by of dark horizontal streaks appearing on a screen by fluctuations of a reference for luminance of a television receiver which are caused by the noises superimposed on the back portion.

US-A-4295161 discloses a keyed noise filter with automatic brightness control.

DE-A-2737749 discloses a noise reducing process that replaces a noisy video signal with a noiseless one.

GB-A-806646 discloses a television signal synchroniser with a corrected pulse generator.

According to the present invention there is provided a video apparatus receiving a video signal and producing an output video signal, the apparatus comprising: separating means for separating a baseband video signal obtained from the received video signal into a colour signal, a luminance signal and a synchronizing signal; and characterised by:

noise eliminating means for receiving the separated luminance and synchronizing signals and eliminating noise superimposed on a back porch portion of the synchronizing signal.

The terminal according to this invention overcomes the problem that the reference for the luminance is disturbed by the noise introduced in the back porch in the process of signal transmission or in the descrambling process, because the noise eliminating means provided in the terminal apparatus integrates the back porch of the video signal and thereby eliminates such noises superimposed on the back porch.

Furthermore, the terminal apparatus according to the present invention overcomes the problem that the AGC is disturbed by the noises in the DC part of the horizontal synchronising signals introduced in the process of signal transmission or in the descrambling process, because the noise eliminating means in the terminal apparatus replaces the DC part of the horizontal synchronising signal of the video signal with the prescribed constant voltage and thereby eliminates such noises superimposed on the DC part.

Still furthermore, the terminal apparatus according to the present invention overcomes the problem that the reference of the luminance is disturbed by the noises introduced in the back porch in the process of signal transmission or in the descrambling process,

because the noise eliminating means in the terminal apparatus replaces the back porch of the video signal with the prescribed constant voltage and thereby eliminates such noises superimposed on the back porch.

In order to solve the problem described hereinabove, a video apparatus in accordance with the present invention comprises first noise eliminating means for eliminating a noise superimposed on a DC part of a horizontal synchronising signal of a video signal by integrating the DC part, and/or separating means for separating the video signal into a colour signal and a luminance signal, and second noise eliminating means for eliminating a noise superimposed on a back porch of the luminance signal by integrating the back porch.

The video apparatus comprises second noise eliminating means for eliminating a noise superimposed on a DC part of a synchronising signal of a video signal by replacing the DC part with a second constant voltage, and/or separating means for separating a video signal and a luminance signal.

The video apparatus with the construction described above overcomes the problem that the AGC in the television receiver is disturbed by the noises introduced in the DC part of the horizontal synchronising signal, because the noise eliminating means in the video apparatus integrates the DC part of the horizontal synchronising signal of the video signal and thereby eliminates such noises overlapping with the DC part.

Moveover, the video apparatus according to the present invention overcomes the problem that the reference for the luminance of the television receiver is disturbed by the noises introduced in the back porch of the video signal, because the noise eliminating means in the video apparatus integrates the back porch of the video signal and thereby eliminates such noises superimposed on the back porch.

Furthermore, the video apparatus according to the present invention overcomes the problem that the AGC in the television receiver is disturbed by the noises in the DC part of the horizontal synchronising signal, because the noise eliminating means in the terminal apparatus replaces the DC part of the horizontal synchronizing signal of the video signal with the prescribed constant voltage and thereby eliminates such noises superimposed on the DC part.

Still furthermore, the terminal apparatus according to the present invention overcomes the problem that the reference for the luminance is disturbed by the noises introduced in the back porch in the process of signal transmission or in the descrambling process, because the noise eliminating means in the terminal apparatus replaces the back porch of the video signal with the prescribed constant voltage and thereby eliminates such noises superimposed on the back porch.

In order to solve the problems described hereinabove, a video apparatus in accordance with the present invention comprises first noise eliminating means for eliminating a noise superimposed on a DC part of a horizontal synchronizing signal of a video signal by integrating the DC part, and/or separating means for separating the video signal into a color signal and a luminance signal, and second noise eliminating means for eliminating a noise superimposed on a back porch of the luminance signal by integrating the back porch.

Alternatively, according to the invention, a video apparatus comprises first noise eliminating means for eliminating a noise superimposed on a DC part of a synchronizing signal of a video signal by replacing the DC part with a first constant voltage, and/or separating means for separating a video signal into a color signal and a luminance signal, and second noise eliminating means for eliminating a noise superimposed on a back porch of the luminance signal by replacing the back porch with a second predetermined constant voltage.

The video apparatus with the construction described above overcomes the problem that the AGC in the television receiver is disturbed by the noises introduced in the DC part of the horizontal synchronizing signal, because the noise eliminating means in the video apparatus integrates the DC part of the horizontal synchronizing signal of the video signal and thereby eliminates such noises overlapping with the DC part.

Moreover, the video apparatus according to the present invention overcomes the problem that the reference for the luminance of the television receiver is disturbed by the noises introduced in the back porch of the video signal, because the noise eliminating means in the said video apparatus integrates the back porch of the video signal and thereby eliminates such noises superimposed on the back porch.

Furthermore, the video apparatus according to the present invention overcomes the problem that the AGC in the television receiver is disturbed by the noises in the DC part of the horizontal synchronizing signal, because the noise eliminating means in the video apparatus replaces the DC part of the horizontal synchronizing signal in the video signal with the prescribed constant voltage and thereby eliminates such noises superimposed on the DC part.

Still further, the video apparatus according to this invention overcomes the problem that the reference for the luminance of the television receiver is disturbed by the noises introduced in the back porch of the video signal, because the noise eliminating means provided in the video apparatus replaces the back porch of the video signal with the prescribed constant voltage and thereby eliminates such noises superimposed on the back porch.

In the drawings:-

Fig. 1 is a waveform chart illustrating a scrambling operation and a descrambling operation;
Fig. 2 and Fig. 3 are circuit diagrams respectively showing examples of AGC circuits;
Fig. 4 is a chart showing charging characteristics of a capacitor in the AGC circuit;
Fig. 5 is a block diagram showing an embodiment of CATV terminal equipment according to the present invention;
Figs. 6(a) through 6(f) are a waveform charts for explaining operations of a white level pulse eliminating circuit shown in Fig. 5;
Figs. 7(a) thorugh 7(d) and Figs. 8(a) through 8(d) are waveform charts for explaining operations of a noise eliminating process circuit presented in Fig. 5;
Fig. 9 is a block diagram showing a second embodiment of the CATV terminal equipment according to the present invention;
Fig. 10 is a block diagram illustrating a third embodiment of the CATV terminal equipment according to the present invention;
Fig. 11 is a block diagram illustrating another embodiment of the CATV terminal equipment according to the present invention;
Fig. 12 is a waveform chart showing the relationship between a pedestal level and a DC part of a horizontal synchronizing signal in a video signal;
Fig. 13 is a circuit diagram showing a modification including changes in some parts of the diagram shown in Fig. 7;
Fig. 14 is a chart showing a modification of a timing generating circuit in the embodiments illustrated in Fig. 5, etc.;
Fig. 15 is a block diagram showing an embodiment of video equipment according to the present invention;
Figs. 16(a) through 16(d) and Figs. 17(a) through 17(d) are waveform charts for explaining operations of a noise eliminating process circuit shown in Fig. 15;
Fig. 18 is a block diagram for explaining a second embodiment of video equipment;
Fig. 19 is a block diagram showing a third embodiment of video equipment;
Fig. 20 is a waveform chart illustrating a video signal from which the noises have been eliminated by the equipment shown in Fig. 19;
Fig. 21 is a block diagram illustrating a modification of the embodiment of the present invention shown in Fig. 19;
Fig. 22 is a block diagram illustrating another embodiment of video equipment;
Fig. 23 is a circuit diagram showing a modification including changes in some parts of the diagram shown in Fig. 22; and
Fig. 24 is a chart showing a modification of a timing generating circuit in the embodiments illustrated in Fig. 15, etc.

Preferred embodiments of the present invention are described with reference to the accompanying drawings.

Fig. 5 illustrates one embodiment of CATV terminal equipment according to the present invention. In this figure, an RF signal transmitted via a coaxial cable from a CATV center is applied to a branching device 1 through an input terminal IN, and the signal is divided by this branching device 1. One part of the signal as divided by this branching device 1 is fed via an outband data receiver 2a to a control circuit 2b composed of a CPU which operates in accordance with a predetermined program, while the other part of the RF signal branched off by the branching device 1 is fed into a converter 3.

The outband data receiver 2a mentioned above detects the data that specifies a channel capable of signal reception in the converter 3 in the terminal equipment and the data indicating whether or not the terminal can receive an event program. Moreover, the converter 3 selects a particular channel under the control of the control circuit 2b and outputs a signal of the selected channel, frequency converts the signal to produce an intermediate frequency signal on its output terminal, and also detects a key signal included in an audio intermediate frequency signal of the low frequency range and sends out this signal to the control circuit 2b. This key signal contains information on the timing at which the horizontal synchronizing signal portion H of the video signal is compressed at the center, which is, in other words, the information on the timing at which the horizontal synchronizing signal portion H is to be expanded in the terminal equipment. Also, when the GSS system detects a vertical synchronizing signal, the terminal equipment detects the timing at which the key signal in the horizontal synchronizing signal becomes absent and, using the detected key signal as a trigger, generates a timing of the vertical synchronizing signal to produce the vertical synchronizing signal. The intermediate frequency signal which is obtained at the output of the converter 3 is input to a descrambler 4, in which the intermediate frequency video signal Fv of the high frequency range is descrambled.

Moreover, the control circuit 2b decodes the expansion data for the horizontal synchronizing signal portion of the video signal on the basis of the outband data acquired by the outband data receiver 2a and the key signal mentioned above. Then, the expansion data is sent out from the control circuit 2b to the descrambler 4, and on the basis of this data the descrambler 4 descrambles the video signal Fv, which has been scrambled, at the expansion timing corresponding to the key signal. The intermediate frequency video signal as descrambled with the descrambler 4 and the intermediate frequency audio signal from which the key signal has been eliminated are detect-

ed by an audio and video detecting circuit 5. The audio signal so detected is sent out directly to a modulator 5 and the video signal so detected is sent out to a white level pulse eliminating circuit 6.

The white level pulse eliminating circuit 6 eliminates white level pulses (rabbit ear noise), which are the fore and rear portions left over in the restoration process of the video signal due to the difference between the compressing period (t_1) at the time of scrambling and the expanding period (t_2) at the time of descrambling by the GSS system, by replacing the white level pulses with the signal at the pedestal level or at a level in the neighborhood of the pedestal level of the received video signal. The white level pulse eliminating circuit 6 is controlled with the control signal, which is described later, from the control circuit 2b. In the case of the SSS system, the signal passes through the white level pulse eliminating circuit 6 without receiving any substantial operation.

The video signal from which the white level pulses have been eliminated with the white level eliminating circuit 6 is sent out to a first noise eliminating circuit 9a, in which the noises superimposed on the horizontal synchronizing signal are eliminated. The noise-eliminated video signal is sent out to a Y/C separating circuit 7 which is composed of a 3.58 MHz BPF 7a and a 3.58 MHz trap 7b, and a color signal and a luminance signal is separated from each other in this circuit. The color signal as separated by the Y/C separating circuit 7 is sent out directly to a Y/C combining circuit 8, and the luminance signal is sent out to a second noise eliminating circuit 9b, where the noises superimposed on the back porch portion consisting of the color burst signal and the portions fore and rear of the color burst signal are eliminated. That is to say, the noise eliminating circuits 9a and 9b together form a noise eliminating process circuit which serves to eliminate the noises superimposed on the synchronizing signal and the back porch which have been expanded in the descrambling process. This noise eliminating process circuit is controlled with the timing control signals, which are described later, from a timing generating circuit 10. The video signal from which the noises have been eliminated by the noise eliminating process circuit are put into the Y/C combining circuit 8, in which the luminance signal is combined with the color signal, and the resultant combined signal is sent out to a modulator 11. The combined signal is modulated into a prescribed frequency by the modulator 11 and is then sent out from an output terminal OUT to equipment not illustrated herein, e.g., to a television receiver.

Fig. 6 illustrates the timing relations in the operations of the descrambler 4 and the white level pulse eliminating circuit 6. For convenience in description, the video signals are expressed in the baseband.

More specifically, Fig. 6(a) shows a video signal as transmitted from the center. This video signal has been processed for the compression of the horizontal blanking portion including the horizontal synchronizing signal portion H and the color burst signal portion Cb at a prescribed rate in a period (t_1) of, e.g., 12 μsec. Fig. 6(b) shows a timing signal for the expansion of the video signal in the descrambling process. This timing signal is produced on the basis of the key signal obtained by the key signal detection, and a period of the timing signal (t_2) is, for example, 10 μsec as mentioned above. On the video signal shown in Fig. 6(a), the expansion timing signal shown in Fig. 6(b) works to produce a descrambled signal shown in Fig. 6(c). This descrambled base band video signal is obtained in the output of the audio and video detecting circuit 5.

The key signal obtained by the key signal detection with the converter 3 is sent to the control circuit 2b, in which the timing control signals S_1 and S_2 respectively covering the color burst signal Cb and the white level pulse P on each outer side of the expansion timing signal are obtained.

The white level pulse eliminating circuit 6 is controlled for its switching with the timing control signals S_1 and S_2 mentioned above. This white level pulse eliminating circuit 6 has a video switch SW_1 which is turned on when the control signal S_1 is at a high level, video switches SW_2 and SW_3 which are complementarily turned on with the control signal S_2 and the control signal S_2 as inverted by the inverter I_1, respectively, and an integration circuit consisting of a resistor R_1 and a capacitor C_1. The color burst signal is integrated by turning on the switch SW_1 in accordance with the control signal S_1, and the integration level is output through the switch SW_2 being turned on in accordance with the control signal S_2. With this process, the white level pulses are eliminated and, instead, these portions are kept at the integration level of the color burst signal Cb. As a result of this process, the video signal produced in the output of the white level pulse eliminating circuit 6 will be the signal as shown in Fig. 6(f), which has been obtained by eliminating the pulse P left over in the descrambling process.

Fig. 7 and Fig. 8 illustrate the timing relations in the operations of the noise eliminating process circuit which is composed of the first noise eliminating circuit 9a and the second noise eliminating circuit 9b shown in Fig. 5, and in the Y/C separating circuit 7. For convenience in description, the signals are expressed in the baseband.

More specifically, Fig. 7(a) shows the video signal from which the white level pulses have been eliminated in the white level pulse eliminating circuit 6. This video signal includes noises larger than those in the other portions, as illustrated in Fig. 8(a), as a result of having been subjected to the expanding operation with the descrambler 4 mentioned above, and is sent out to the first noise eliminating circuit 9a. The timing generating circuit 10 has a synchronization

separating circuit 10a which outputs a timing control signal S_3 shown in Fig. 7(b) by separating the synchronizing signal from the video signal, and a one-shot multivibrator circuit 10b which outputs a timing control signal S_4 illustrated in Fig. 7(c) in response to the trailing edge of the timing control signal S_3 output from the synchronization separating circuit 10a. The timing control signals S_3 and S_4 are output respectively to the first noise eliminating circuit 9a and the second noise eliminating circuit 9b.

The first noise eliminating circuit 9a is comprised of an amplifier A_1 and an integration circuit composed of a resistor R_2 and a capacitor C_2, and a switch SW_4 which effect the integration circuit by being turned on in response to the timing control signal S_3 mentioned above. At the output of this first noise eliminating circuit 9a, there is obtained such a video signal that the noises have been eliminated from the DC part of the synchronizing signal, as shown in Fig. 8(b). The video signal which is obtained at the output of this first noise eliminating circuit 9a is divided into the color signal and the luminance signal shown in Fig. 7(d) by the Y/C separating circuit 7, and the luminance signal is sent out to the second noise eliminating circuit 9b.

The second noise eliminating circuit 9b is composed of an amplifier A_2, an integration circuit comprised of a resistor R_3 and a capacitor C_3, and a switch SW_5 which effects the integration circuit by being turned on in response to the timing control signal S_4 mentioned above. At the output of this second noise eliminating circuit 9b, there is obtained such a luminance signal that the noises have been eliminated from the color burst signal and the portions fore and rear of the color burst signal, as shown in Fig. 8(c). This signal is sent out to the Y/C combining circuit 8 and combined with the color signal in this circuit. As a result of the processes mentioned above, a video signal as shown in Fig. 8(d) is produced by eliminating the noises from the portions which have been subjected to the descrambling operation, i.e., the synchronizing signal portion and the back porch portion including the color burst signal, and appears at the output of the Y/C combining circuit 8.

Fig. 9 illustrates a second embodiment of the present invention, and the same parts as those in Fig. 5 are represented by the same reference numbers. In this embodiment, the system is designed to perform the elimination of the noises superimposed on the synchronizing signal and the back porch on the luminance signal separated by the Y/C separating circuit 7. A noise eliminating process circuit 9, which uses an amplifier A_1 and a resistor R_2 in common and has capacitors C_2 and C_3 and switches SW_4 and SW_5, is provided between the Y/C separating circuit 7 and the Y/C combining circuit 8.

Fig. 10 illustrates a third embodiment of the present invention, and the same parts as those in Fig. 5 are indicated by the sane reference numbers. This embodiment has a simplified construction suitable for a television receiver which has a short time constant of AGC but has a sufficient pedestal clamping capability. This system is designed to eliminate only the noises superimposed on the synchronizing signal by the circuit comprising the first noise eliminating circuit 9a and the synchronization separating circuit 10a illustrated in Fig. 5.

In the first through third embodiments described above, the noises are eliminated by an integration circuit comprised of a resistor and a capacitor, but it is feasible to replace the horizontal synchronizing signal portion and the pedestal portion (back porch portion) with a prescribed DC potential.

Fig. 11 illustrates another embodiment which is designed to replace the horizontal synchronizing signal portion and the pedestal portion (back porch portion) with a prescribed DC potential, and the same parts as those in Fig. 5 are indicated with the same reference numbers. In this embodiment, a luminance signal separated by a Y/C separating circuit 7 is sent out to a level clamping circuit 12 which clamps the pedestal level. This pedestal clamping circuit 12 is the circuit for maintaining the DC level of the video signal at a certain constant potential on the basis of the horizontal sync DC level of the baseband signal. The luminance signal whose DC level is maintained at a constant potential by the pedestal clamping circuit 12 is sent out to a noise eliminating process circuit 9′.

The noise eliminating process circuit 9′ is provided with switches SW_6 and SW_6', which are complementarily turned on by the effect of an inverter I_2 in response to a timing control signal S_3, switches SW_7 and SW_7' which are complementarily turned on by the effect of an inventer I_3 in response to a timing control signal S_4, a first voltage generator E_1 which generates a voltage corresponding to the level of the horizontal synchronizing signal that is lower by a certain constant voltage value than the pedestal level, and a second voltage generator E_2 which generates a voltage corresponding to the level of the pedestal level. This noise eliminating process circuit 9′ replaces the DC part of the horizontal synchronizing signal and the pedestal portion (back porch portion) with the respective prescribed voltages by controlling the on and off operations of the switches SW_6 through SW_7' with the timing control signals S_3 and S_4, thereby eliminating the noises superimposed on those portions.

In this regard, as shown in Fig. 12, the video signal is set in such a way that the pedestal level will be 0 IRE (the unit of the video signal level), that the maximum level of the video signal will be 100 IRE, and that the DC part of the horizontal synchronizing signal will be -40 IRE. Therefore, the DC part of the horizontal synchronizing signal will be at the potential level lower by 0.57 V than the pedestal level when the peak-to-peak amplitude of the video signal is set at 2 $V_{P\text{-}P}$, as shown in Fig. 12. This value (0.57 V) is a val-

ue approximately equal to the base-emitter voltage V_{BE} of transistors.

Therefore, the level clamping circuit 12 and the noise eliminating process circuit 9′ mentioned above can be combined into a circuit construction shown in Fig. 13. In Fig. 13, a level clamping circuit 12 is comprised of a voltage generator E_3, a transistor Q_1 to the base of which a voltage V_1 generated by this voltage generator E_3 is applied, and an emitter resistor R_{e1}. The level clamping operation is performed by constantly feeding the emitter voltage (V_1 - V_{BE}) from the transistor Q_1 to the video signal line to which the luminance signal is input via a coupling capacitor C_4. A noise eliminating process circuit 9″ has a transistor Q_2, to the base of which the voltage V_1 generated by the voltage generator E_3 in the level clamping circuit 12 is applied, and an emitter resistor R_{e2}. With the construction described above, the emitter voltage (V_1 - V_{BE}) of the transistor Q_2 is substituted for the synchronizing signal by turning off the switch SW_6′ and turning on the switch SW_6 with the timing control signal S_3 kept at a high level during the synchronizing signal period and the voltage V_1 generated by the voltage generator E_3 is substituted for the back porch portion by turning off the switch SW_7′ and turning on the switch SW_7 with the timing control signal S_4 kept at a high level during the back porch period.

It is noted that the video signal of 2 $V_{P\text{-}P}$ is converted into a video signal of 1 $V_{P\text{-}P}$ by terminating it with a resistor of 75 Ohms at its input side.

The timing generating circuit 10 in the embodiments explained above is composed of a synchronization separating circuit 10a and a one-shot multivibrator circuit 10b. This can be changed to a construction illustrated in Fig. 14. In Fig. 14, a free-running synchronization generating circuit 10c is inserted between the synchronization separating circuit 10a and the one-shot multivibrator circuit 10b. This free-running synchronization generating circuit 10c makes it possible to eliminate the jitters due to the noises included in the horizontal synchronizing signal since this circuit generates on a free-running basis the horizontal synchronizing signals during one vertical synchronizing period by counting the horizontal synchronizing signals in the vertical synchronizing signal which has been separated by the synchronization separating circuit 10a.

In the above embodiments, the horizontal synchronizing signal portion and the back porch portion are integrated or replaced by the appropriate voltages using the voltage generators, the invention is not limited to those embodiments. For example, the horizontal synchronizing signal portion and the back porch portion may be replaced by appropriate voltages produced by a sampling hold method. This method offers the advantage that the replacing voltage level produced by the sampling hold method is more stable than the level produced by the integration.

As described in the foregoing, the terminal equipment according to the present invention is capable of eliminating the noises superimposed on the synchronizing signal in the process of signal transmission or in the descrambling process, thereby offering the advantage that the AGC voltage in the AGC circuit of the television receiver will not be liable to fluctuations due to such noises and that the picture quality on the screen will not be deteriorated in consequence of the luminance fluctuations in the form of fine streaks running in the horizontal direction on the screen.

In addition, the terminal equipment according to the present invention is capable of eliminating the noises superimposed on the back porch portion in the process of signal transmission or in the descrambling process, offering the advantage that the reference for the luminance of the television receiver will not be affected with fluctuations due to such noises and that the picture quality will not be deteriorated in consequence of the appearance of dark streaks in the horizontal direction on the screen.

In the following, the preferred embodiments of a second aspect of the present invention are described with reference to the accompanying drawings. The second aspect deals with video equipment such as a television receiver solely, i.e., separately from the CATV system.

Fig. 15 illustrates principal parts of a television receiver which is one embodiment of video equipment according to the present invention. In this figure, television broadcasting waves received with an antenna not illustrated in the figure are input to a tuner 21, which selects a particular channel under the control of a control circuit not illustrated in the figure, frequency-converts the signal of the selected channel, and outputs the converted signal as an intermediate frequency signal at its output terminal.

The intermediate frequency signal obtained at the output from the tuner 21 is divided into a video intermediate frequency signal in the higher frequency range and an audio intermediate frequency signal in the lower frequency range, and the video intermediate frequency signal is put into the video detecting circuit 22. The video signal detected by the video detecting circuit 22 is sent to a first noise eliminating circuit 23a, in which the noises superimposed on the horizontal synchronizing signal portion are eliminated.

Such a video signal in which the noises in the horizontal synchronizing signal portion have been eliminated is sent to a Y/C separating circuit 24 composed of a 3.58 MHz BPF and a 3.58 MHz trap, in which the video signal is separated into a color signal and a luminance signal. The color signal as separated by the Y/C separating circuit 24 is sent to a color processing circuit not illustrated in the figure, and the luminance signal is sent to a second noise eliminating circuit 23b, where the noises superimposed on the color

burst signal and the portions fore and rear of the color burst signal portion are eliminated.

That is, the noise eliminating circuits 23a and 23b mentioned above together form a noise eliminating process circuit which serves to eliminate the noises superimposed on the synchronizing signal and the back porch and is controlled with timing control signals, which are described later, from a timing generating circuit 25. The video signal from which the noises have been eliminated by the noise eliminating process circuit is sent to a pedestal clamping circuit and a luminance processing circuit, which are not shown in the figure.

The timing generating circuit 25 mentioned above is composed of a synchronization separating circuit 25a which separates the synchronizing signal H from the video signal shown in Fig. 16(a), and a one-shot multivibrator circuit 25b which generates a pulse signal continuing for a prescribed duration of time in response to the trailing edge of the synchronizing signal H separated by this synchronization separating circuit 25a. The synchronizing signal H which has been thus separated by the synchronization separating circuit 25a is sent to the synchronizing circuit not illustrated in the figure and is also sent as a timing control signal S_{11} to the first noise eliminating circuit 23a, while the pulse signal generated by the on-shot multivibrator circuit 25b is sent as a timing control signal S_{12} to the second noise eliminating circuit 23b.

The first noise eliminating circuit 23a is comprised of an integration circuit composed of a resistor R_{11} and a capacitor C_{11}, and a switch SW_{11} which effects the integration circuit by being turned on in response to the timing control signal S_{11} mentioned above. To this first noise eliminating circuit 23a is input a video signal on which noises N are superimposed as illustrated in Fig. 17(a). And, such a video signal that the noises from the DC part of the synchronizing signal have been eliminated is obtained at the output of this first noise eliminating circuit 23a, as shown in Fig. 17(b). The video signal obtained at the output of this first noise eliminating circuit 23a is separated into the color signal and the luminance signal shown in Fig. 17(c) by the Y/C separating circuit 24, and the luminance signal is sent to the second noise eliminating circuit 23b.

The second noise eliminating circuit 23b has an integration circuit comprised of a resistor R_{12} and a capacitor C_{12}, and a switch SW_{12} which effects the integration circuit by being turned on in response to the timing control signal S_{12} mentioned above. The video signal shown in Fig. 17(c) is input to this second noise eliminating circuit 23b, and at the output of this second noise eliminating circuit 29b there appears a luminance signal as shown in Fig. 17(d), which is formed by eliminating the noises superimposed on the back porch portion.

Fig. 18 illustrates a second embodiment according to the second aspect of the present invention, and the same parts as those in Fig. 15 are represented with the same reference numbers. In this embodiment, the system is provided with a noise eliminating process circuit 23, which is composed of an amplifier A_0, a resistor R_0, capacitors C_{11} and C_{12}, switches SW_{11} and SW_{12}, and is set on the output side of a Y/C separating circuit 24. This noise eliminating process circuit 23 eliminates the noises superimposed on the synchronizing signal and the back porch of the luminance signal as separated by the Y/C separating circuit 24.

Fig. 19 illustrates principal parts of a VCR which is one embodiment of video equipment according to the present invention, and the parts which are the same as those in the embodiment of Fig. 15 are indicated with the same reference numbers.

A video signal from a tuner section or a reproducing section is input to a first noise eliminating circuit 23a in which the noises superimposed on the horizontal synchronizing signal are eliminated. Such a video signal that the noises have been eliminated from the horizontal synchronizing signal is sent to a Y/C separating circuit 24 composed of a 3.58 MHz BPF 24a and a 3.58 MHz trap 24b, and is separated into a color signal and a luminance signal in this circuit. The color signal separated by the Y/C separating circuit 24 is sent directly to a Y/C combining circuit 26, and the luminance signal is sent to the second noise eliminating circuit 23b, where the noises are eliminated from the back porch.

That is, the first and second noise eliminating circuits 23a and 23b together comprise a noise eliminating process circuit which eliminates the noises included in the synchronizing signal and the back porch, and this circuit is controlled with timing control signals from a timing generating circuit 25. The luminance signal from which the noises have been eliminated by the noise eliminating process circuit is input to the Y/C combining circuit 26, in which the luminance signals is combined with the color signal. The resultant signal so combined is sent via an amplifier A and an output terminal OUT to a television receiver or the like not illustrated in the figure. The first and second noise eliminating circuits 23a and 23b in this embodiment are identical to that shown in Fig. 15 except that these circuits are provided with amplifiers A_{11} and A_{12}, respectively. Moreover, the first noise eliminating circuit 23a is not needed in a VDP not provided with an AGC circuit.

In this embodiment, such a video signal that the noises have been eliminated from the DC part of the synchronizing signal and the back porch, as shown in Fig. 20, is sent to the output terminal OUT, when a video signal with noises N as shown in Fig. 17(a) is input to the system.

Fig. 21 illustrates a modified construction of the embodiment shown in Fig. 19, and the same parts as

those in Fig. 19 are indicated by the same reference numbers. In this modification, a noise eliminating process circuit 23, which is composed of an amplifier A_0, a resistor R_0, capacitors C_{11} and C_{12}, and switches SW_{11} and SW_{12}, is provided between a Y/C separating circuit 24 and a Y/C combining circuit 26. This circuit 23 eliminates the noises superimposed on the DC part of the synchronizing signal and the back porch of the luminance signal separated by the Y/C separating circuit 24.

In the embodiments of Figs. 15, 18, 19 and 21, the noises are eliminated by an integration circuit comprised of a resistor and a capacitor, but it is also feasible to replace the horizontal synchronizing signal and the pedestal portion (back porch portion) with a prescribed DC potential. Fig. 22 illustrates such an embodiment, and the same parts as those in Fig. 5 are indicated with the same reference numbers. In this embodiment, a luminance signal separated by a Y/C separating circuit 24 is sent out to a level clamping circuit 27, which clamps the pedestal level. This pedestal clamping circuit 27 is the circuit for maintaining the DC level of the video signal at a certain constant potential on the basic of a DC level immediately subsequent to the color burst signal in the baseband signal. The luminance signal whose DC level is thus maintained at a constant potential by the pedestal clamping circuit 27 is sent to a noise eliminating process circuit 23′.

The noise eliminating process circuit 23′ is provided with switches SW_{21} and SW_{21}' which are complementarily turned on by the effect of an inverter I_2 in response to a timing control signal S_{11}, switches SW_{22} and SW_{22}' which are complementarily turned on by the effect of an inverter I_3 in response to a timing control signal S_{12}, a first voltage generator E_1 which generates a voltage that is lower by a certain constant voltage value that the pedestal level, and a second voltage generator E_2 which generates a voltage corresponding to the level of the pedestal level. This noise eliminating process circuit 23′ replaces the DC part of the horizontal synchronizing signal and the pedestal portion with the respective prescribed voltage by controlling the on and off operations of the switches SW_{21} through SW_{22}' with the timing control signals S_{11} and S_{12}, thereby eliminating the noises superimposed on those portions.

In this regard, as shown in Fig. 12, the video signal is set in such a way that the pedestal level will be 0 IRE (the unit of the video signal level), that the maximum level of the video signal will be 100 IRE, and that the DC part of the horizontal synchronizing signal will be —40 IRE. Therefore, the DC part of the horizontal synchronizing signal will be at the potential level lower by 0.57 V than the pedestal level when the peak-to-peak amplitude of the video signal is set at 2 $V_{P\text{-}P}$ as shown in Fig. 12. This value (0.57 $V_{p\text{-}p}$) is a value approximately equal to the base-emitter voltage V_{BE} of transistors.

Therefore, the level clamping circuit 27 and the noise eliminating process circuit 23′ mentioned above can be combined into a circuit construction shown in Fig. 23. In Fig. 23, a level clamping circuit 27 is comprised of a voltage generator E_3, a transistor Q_1 to the base of which a voltage V_1 generated by this voltage generator E_3 is applied, and an emitter resistor R_{e1}. The level clamping operation is performed by constantly feeding the emitter voltage (V_1 - V_{BE}) from the transistor Q_1 to the video signal line to which the luminance signal is input via a coupling capacitor C_4. A noise eliminating process circuit 23″ has a transistor Q_2 to the base of which the voltage V_1 generated by the voltage generator E_3 in the level clamping circuit 7 is applied, and an emitter resistor R_{e2}. With the construction described above, the emitter voltage (V_1 - V_{BE}) of the transistor Q_2 is substituted for a synchronizing signal by turning off the switch SW_6' and turning on the switch SW_6 with the timing control signal S_{11} generated in the synchronizing signal period, and the voltage V_1 generated by the voltage generator E_3 is substituted for the back porch portion by turning off the switch SW_7' and turning on the switch SW_7 with the timing control signal S_{12} kept at a high level during the back porch period.

It is noted that the video signal of 2 $V_{P\text{-}P}$ is converted into a video signal of 1 $V_{P\text{-}P}$ by terminating it with a resistor of 75 Ohms.

Furthermore, the construction in the combination of the level clamping circuit 27 and the noise eliminating process circuit 23′ or 23″ in Fig. 22 and Fig. 23 can be applied also to such video equipment as VCR and VDP. In such a case, however, the luminance signal from which the noises have been eliminated by the noise eliminating process circuit 23′ or 23″ will be output after it is combined with the color signal in a Y/C combining circuit.

The timing generating circuit 25 in the embodiments explained above is composed of a synchronization separating circuit 25a and a one-shot multivibrator circuit 25b. This can be changed to a construction as illustrated in Fig. 24. In Fig. 24, a free-running synchronization generating circuit 25c is inserted between the synchronization separating circuit 25a and the one-shot multivibrator circuit 25b. This free-running synchronization generating circuit 25c makes it possible to eliminate the jitters due to the noises included in the horizontal synchronizing signal, since this circuit generates on a free-running basis the horizontal synchronizing signals during one vertical synchronizing period by counting the horizontal synchronizing signals in the vertical synchronizing signal which has been separated by the synchronization separating circuit 25a.

As described in the foregoing, the equipments according to the second aspect of the present invention is capable of eliminating the noises superim-

posed on the synchronizing signal of the video signal, thereby offering the advantage that the AGC voltage of the AGC circuit in the television receiver will not be liable to fluctuations due to such noises and that the picture quality on the screen will not be deteriorated in consequence of the luminance fluctuations in the form of fine streaks running in the horizontal direction on the screen.

Furthermore, the equipment according to the present invention is capable of eliminating the noises superimposed on the back porch portion of the video signal, offering the advantage that the reference for the luminance of the television receiver will not be affected by fluctuations due to such noises and that the picture quality will not be deteriorated in consequence of the appearance of dark streaks in the horizontal direction on the screen.

Claims

1. A video apparatus receiving a video signal and producing an output video signal, the apparatus comprising:

   separating means (7,10a) for separating a baseband video signal obtained from the received video signal into a colour signal, a luminance signal and a synchronizing signal; and characterised by:

   noise eliminating means (9b,9,9′,23b, 23,23′) for receiving the separated luminance and synchronizing signals and for eliminating noise superimposed solely on a back porch portion of the synchronizing signal.

2. A video apparatus according to claim 1, wherein the noise eliminating means (9b,9,23b,23′) includes an integrator for integrating the back porch signal.

3. A video apparatus according to claim 1, wherein the noise eliminating means (9′,23′) includes a signal replacement circuit for replacing the back porch signal with a first predetermined constant voltage.

4. A video apparatus according to claim 2 or claim 3, wherein the video apparatus further comprises second noise eliminating means (9a,9,23b,23) for eliminating noise superimposed on a DC part of a horizontal synchronising signal portion of the baseband video signal or the luminance signal by integrating the DC part thereof.

5. A video apparatus according to claim 2 or claim 3, wherein the video apparatus further comprises second noise eliminating means (9′,23′) for eliminating noise superimposed on a DC part of a horizontal synchronising signal portion of the baseband video signal or the luminance signal by replacing the DC part thereof with a second predetermined constant voltage.

6. A video apparatus according to any one of the proceeding claims, wherein the video apparatus is a CATV terminal receiving the video signal from a transmission line.

7. A video apparatus according to claim 6, wherein the CATV terminal apparatus further comprises descrambling means (4) for descrambling the video signal that is received as a scrambled video signal, and the baseband video signal is obtained from the descrambled video signal.

Patentansprüche

1. Videovorrichtung, die ein Videosignal empfängt und ein Ausgangsvideosignal erzeugt, wobei die Vorrichtung umfaßt:
   eine Trenneinrichtung (7,10a), die ein Basisbandvideosignal, das aus dem empfangenen Videosignal gewonnen wird, in ein Farbsignal, ein Helligkeitssignal und ein Synchronisationssignal aufteilt; und **gekennzeichnet durch**:
   eine Rauschbeseitigungseinrichtung (9b,9,9′, 23b,23,23′), die das abgetrennte Helligkeits- und das Synchronisationssignal empfängt und Rauschen beseitigt, das lediglich einen hinteren Schwarztreppenanteil des Synchronisationssignals überlagert.

2. Videovorrichtung nach Anspruch 1, wobei die Rauschbeseitigungseinrichtung (9b,9,23b,23′) einen Integrator enthält, der das hintere Schwarztreppensignal integriert.

3. Videovorrichtung nach Anspruch 1, wobei die Rauschbeseitigungseinrichtung (9′,23′) eine Signalaustauschschaltung enthält, die das hintere Schwarztreppensignal gegen eine erste vorgegebene Konstantspannung austauscht.

4. Videovorrichtung nach Anspruch 2 oder 3, wobei die Videovorrichtung des weiteren eine zweite Rauschbeseitigungseinrichtung (9a,9,23b,23) umfaßt, die Rauschen beseitigt, das einen Gleichspannungsteil eines horizontalen Synchronisationssignalanteils des Basisbandvideosignals oder des Helligkeitssignals überlagert, indem der Gleichspannungsteil desselben integriert wird.

5. Videovorrichtung nach Anspruch 2 oder 3, wobei die Videovorrichtung des weiteren eine zweite

Rauschbeseitigungseinrichtung (9′,23′) umfaßt, die Rauschen beseitigt, das einen Gleichspannungsteil eines horizontalen Synchronisationssignalanteils des Basisbandvideosignals oder des Helligkeitssignals überlagert, indem der Gleichspannungsteil desselben gegen eine zweite vorgegebene Konstantspannung ausgetauscht wird.

6. Videovorrichtung nach einem der vorangehenden Ansprüche, wobei die Videovorrichtung ein Gemeinschaftsantennenfernsehendgerät ist, das das Videosignal von einer Übertragungsleitung empfängt.

7. Videovorrichtung nach Anspruch 6, wobei das Gemeinschaftsantennenfernsehendgerät des weiteren eine Entwürflungseinrichtung (4) zum Entwürfeln des Videosignals umfaßt, das als ein verwürfeltes Videosignal empfangen wird, und das Basisbandvideosignal aus dem entwürfelten Videosignal gewonnen wird.

Revendications

1. Appareil vidéo recevant un signal vidéo et engendrant un signal vidéo de sortie, l'appareil comprenant :

   des moyens de séparation (7, 10a) destinés à séparer un signal vidéo de bande de base obtenu à partir du signal vidéo reçu en un signal de couleur, un signal de luminance et un signal de synchronisation H, et caractérisé par

   des moyens de suppression du bruit (9b, 9, 9′, 23b, 23, 23′) destinés à recevoir les signaux S de luminance et de synchronisation séparés et à supprimer le bruit superposé uniquement à une partie de palier arrière du signal de synchronisation.

2. Appareil vidéo suivant la revendication 1, caractérisé en ce que le moyen de suppression du bruit (9b, 9, 23b et 23′) comprend un intégrateur destiné à intégrer le signal de palier arrière.

3. Appareil vidéo suivant la revendication 1, caractérisé en ce que le moyen de suppression du bruit (9′, 23′) comprend un circuit de remplacement de signal destiné à remplacer le signal de palier arrière par une tension constante prédéterminée.

4. Appareil vidéo suivant la revendication 2 ou 3, caractérisé en ce que l'appareil vidéo comprend, en outre, un second moyen de suppression du bruit (9a, 9, 23b, 23) destiné à supprimer le bruit superposé à une partie CC d'une partie de signal de synchronisation horizontale du signal vidéo de bande de base ou du signal de luminance par l'intégration de la partie CC de celui-ci.

5. Appareil vidéo suivant la revendication 2 ou 3, caractérisé en ce que l'appareil vidéo comprend, en outre, un second moyen de suppression du bruit (9′, 23′) destiné à supprimer le bruit superposé à une partie CC d'une partie de signal de synchronisation horizontale du signal vidéo de bande de base ou du signal de luminance par le remplacement de la partie CC de celui-ci par une seconde tension constante prédéterminée.

6. Appareil vidéo suivant l'une quelconque des revendications précédentes, caractérisé en ce que l'appareil vidéo est un terminal pour télévision par câble recevant le signal vidéo à partir d'une ligne de transmission.

7. Appareil vidéo suivant la revendication 6, caractérisé en ce que le dispositif terminal pour télévision par câble comprend, en outre, un moyen de débrouillage (4) destiné à débrouiller le signal vidéo qui est reçu comme un signal vidéo brouillé, et en ce que le signal vidéo de bande de base est obtenu à partir du signal vidéo débrouillé.

FIG. 1(a) BASE BAND VIDEO SIGNAL

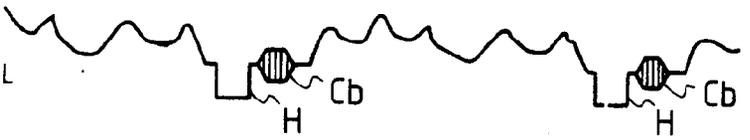


FIG. 1(b) Fv

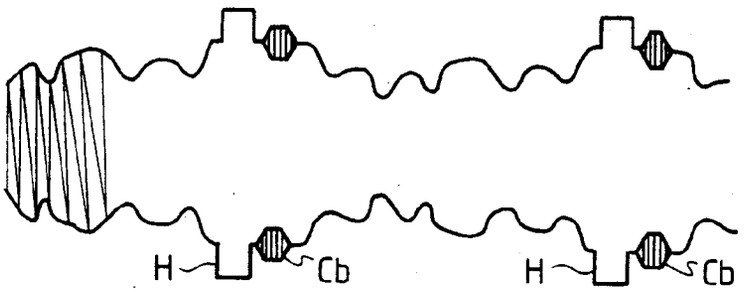


FIG. 1(c) SCRAMBLED Fv

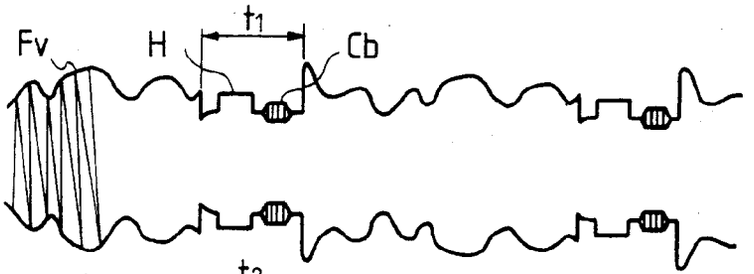


FIG. 1(d) DESCRAMBLED Fv

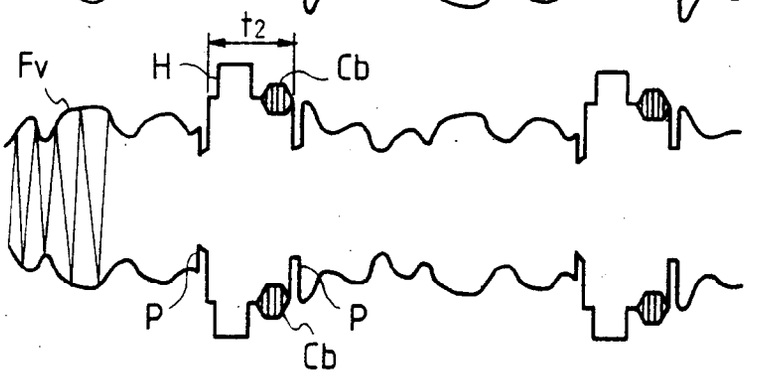


FIG. 1(e) BASE BAND VIDEO SIGNAL

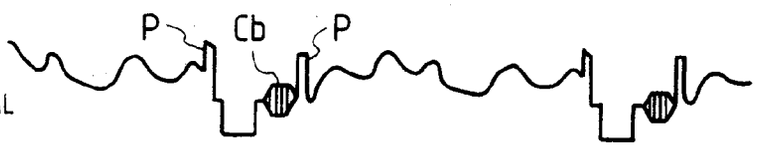


FIG. 2 PRIOR ART

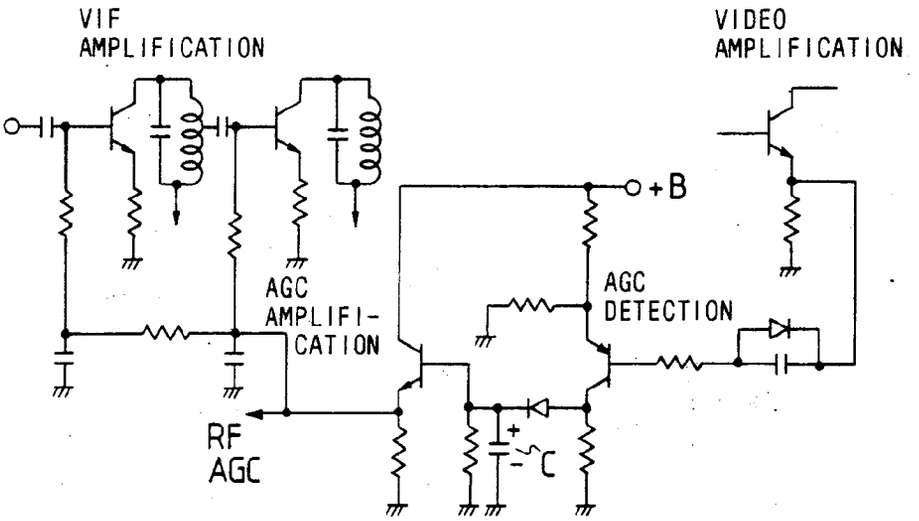


FIG. 3 PRIOR ART

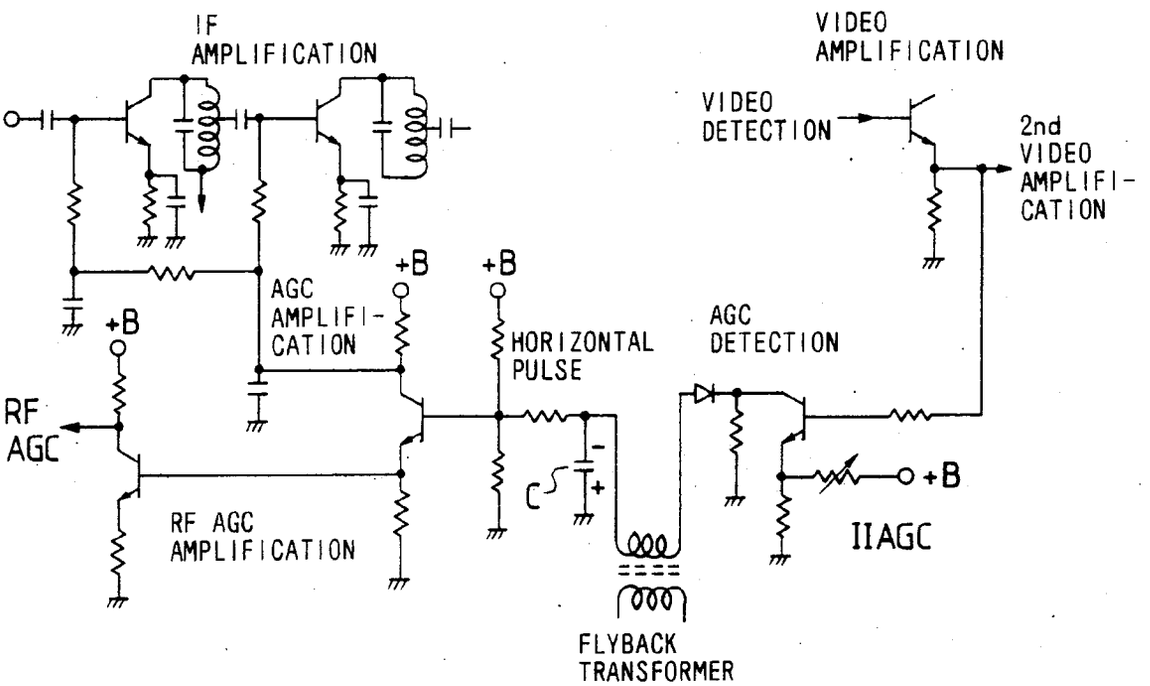


FIG. 4

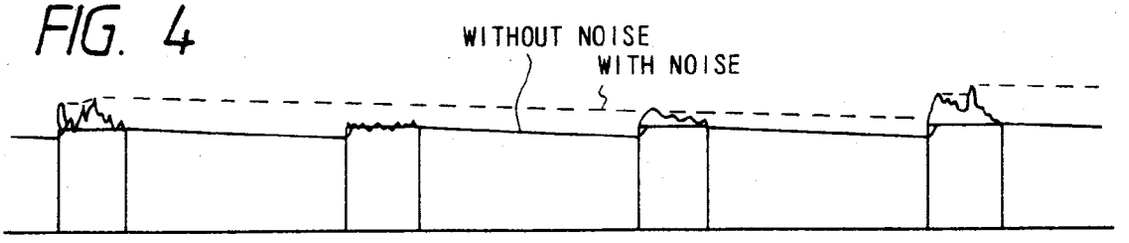


FIG. 5

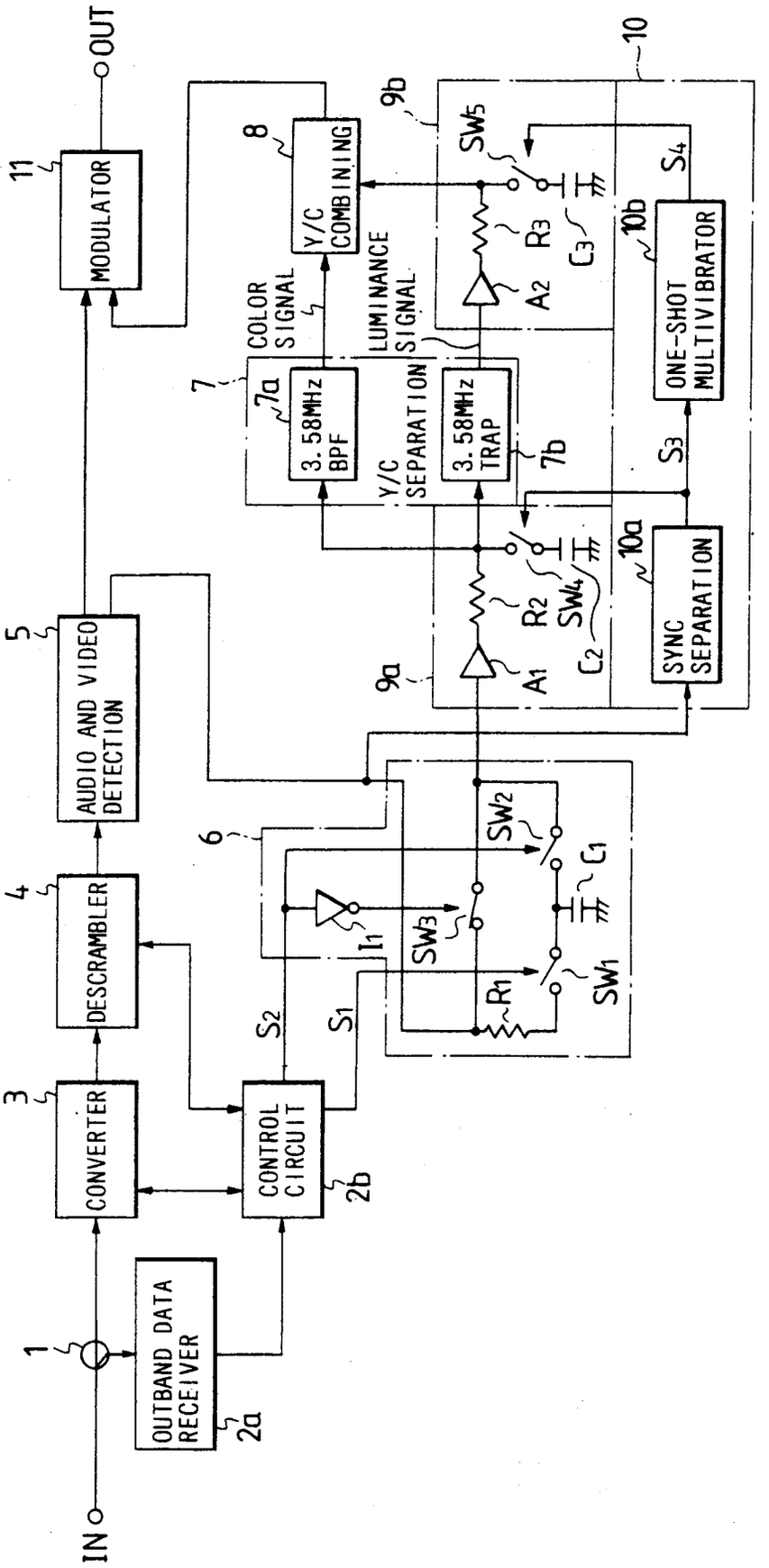

IN
OUT
1
OUTBAND DATA RECEIVER
2a
CONTROL CIRCUIT
2b
CONVERTER
3
DESCRAMBLER
4
AUDIO AND VIDEO DETECTION
5
MODULATOR
11
6
7
Y/C SEPARATION
7a
3.58MHz BPF
7b
3.58MHz TRAP
COLOR SIGNAL
LUMINANCE SIGNAL
8
Y/C COMBINING
9a
9b
10
10a
SYNC SEPARATION
10b
ONE-SHOT MULTIVIBRATOR
A1
A2
R1
R2
R3
C1
C2
C3
I1
SW1
SW2
SW3
SW4
SW5
S1
S2
S3
S4

FIG. 6(a)

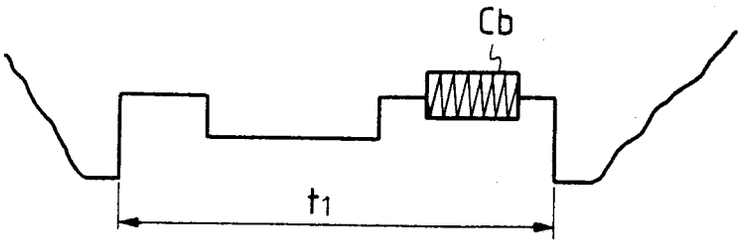


FIG. 6(b)

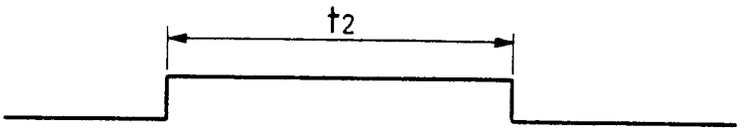


FIG. 6(c)

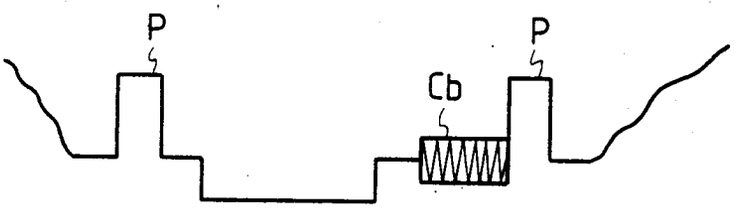


FIG. 6(d)



FIG. 6(e)

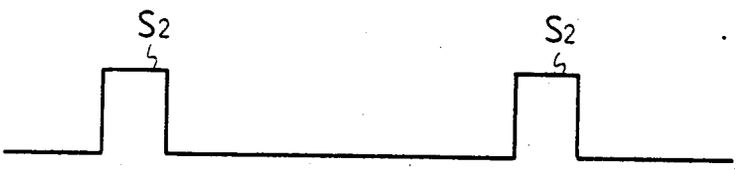


FIG. 6(f)

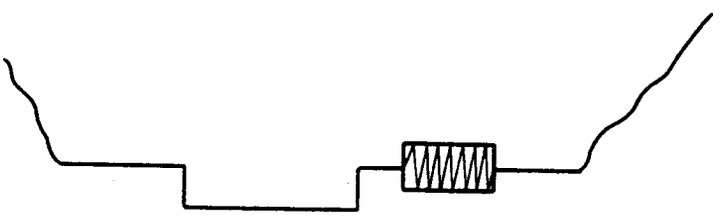


FIG. 7(a)

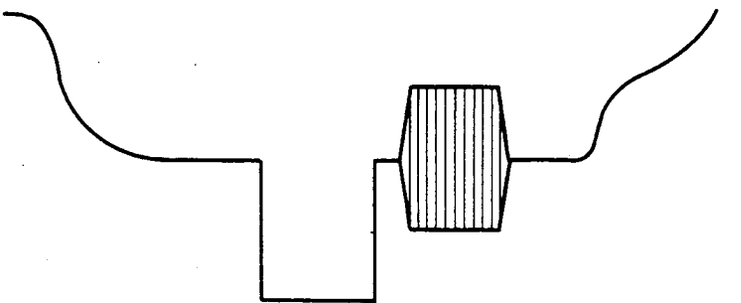


FIG. 7(b) S_3

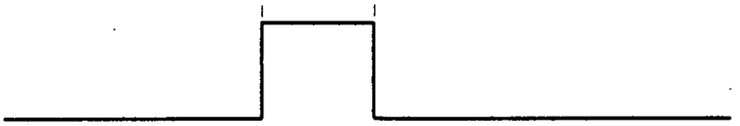


FIG. 7(c) S_4

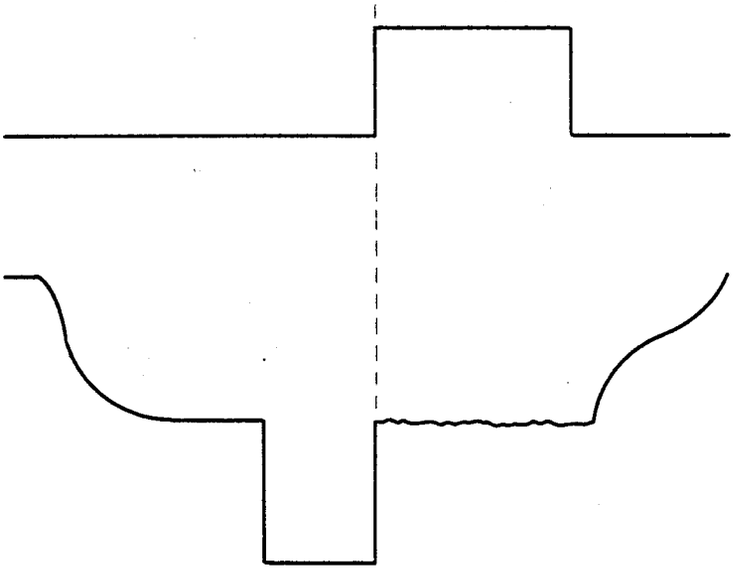


FIG. 7(d)

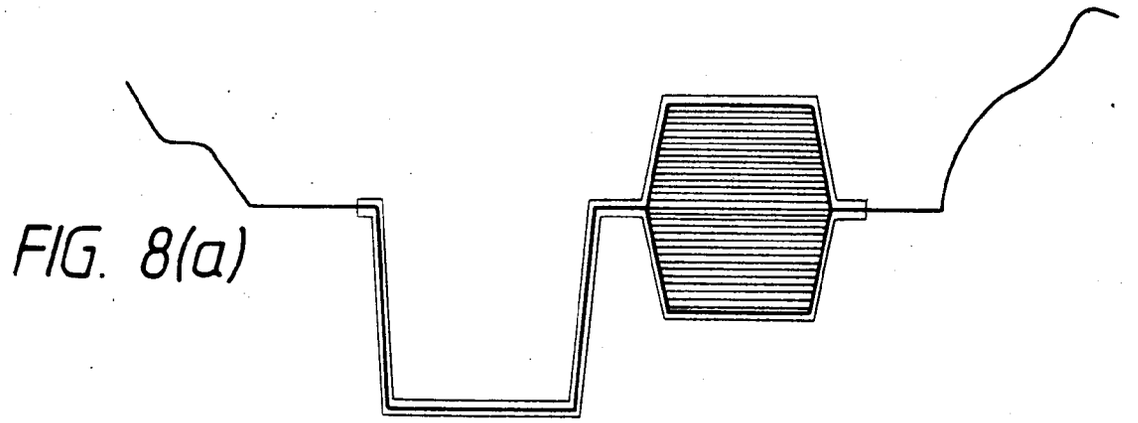


FIG. 8(a)

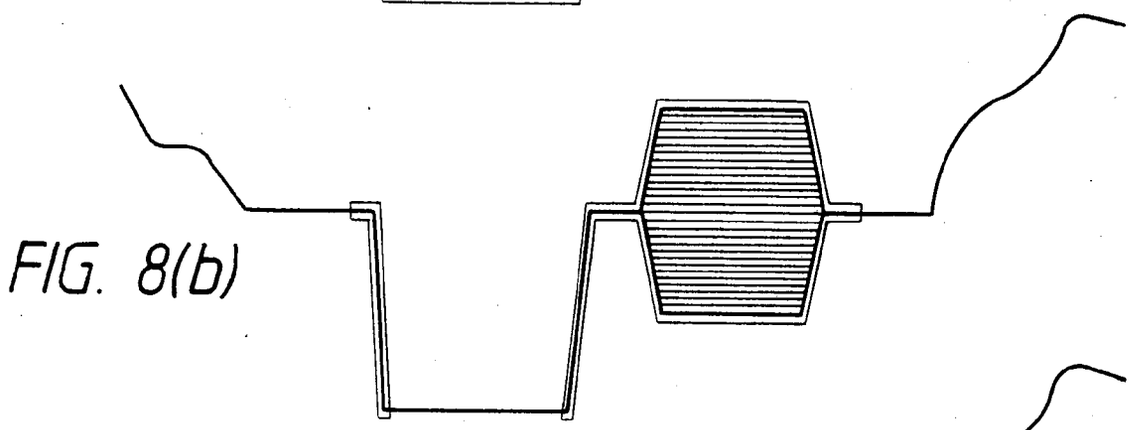


FIG. 8(b)

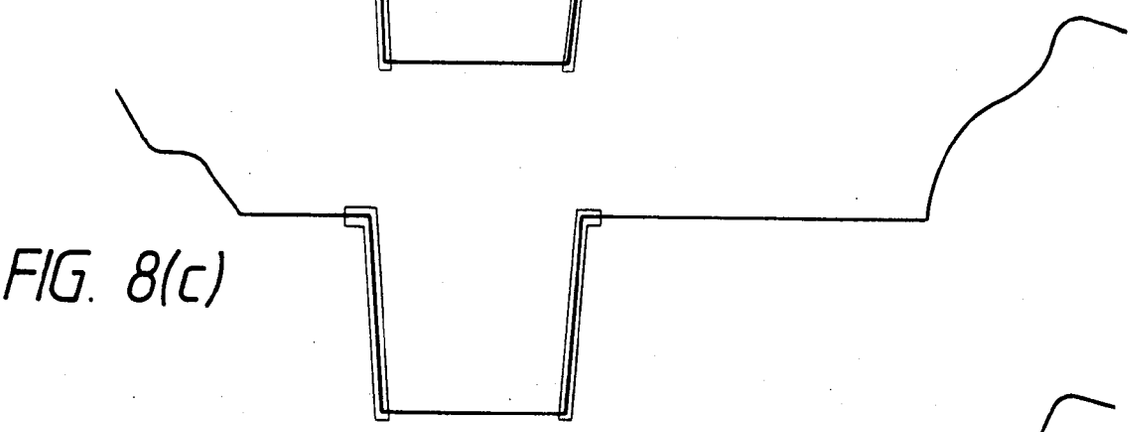


FIG. 8(c)

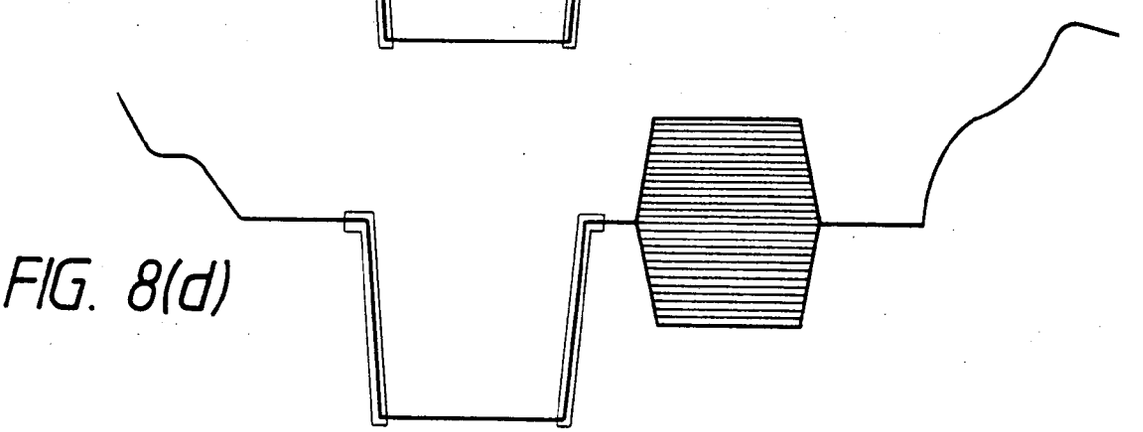


FIG. 8(d)

FIG. 9

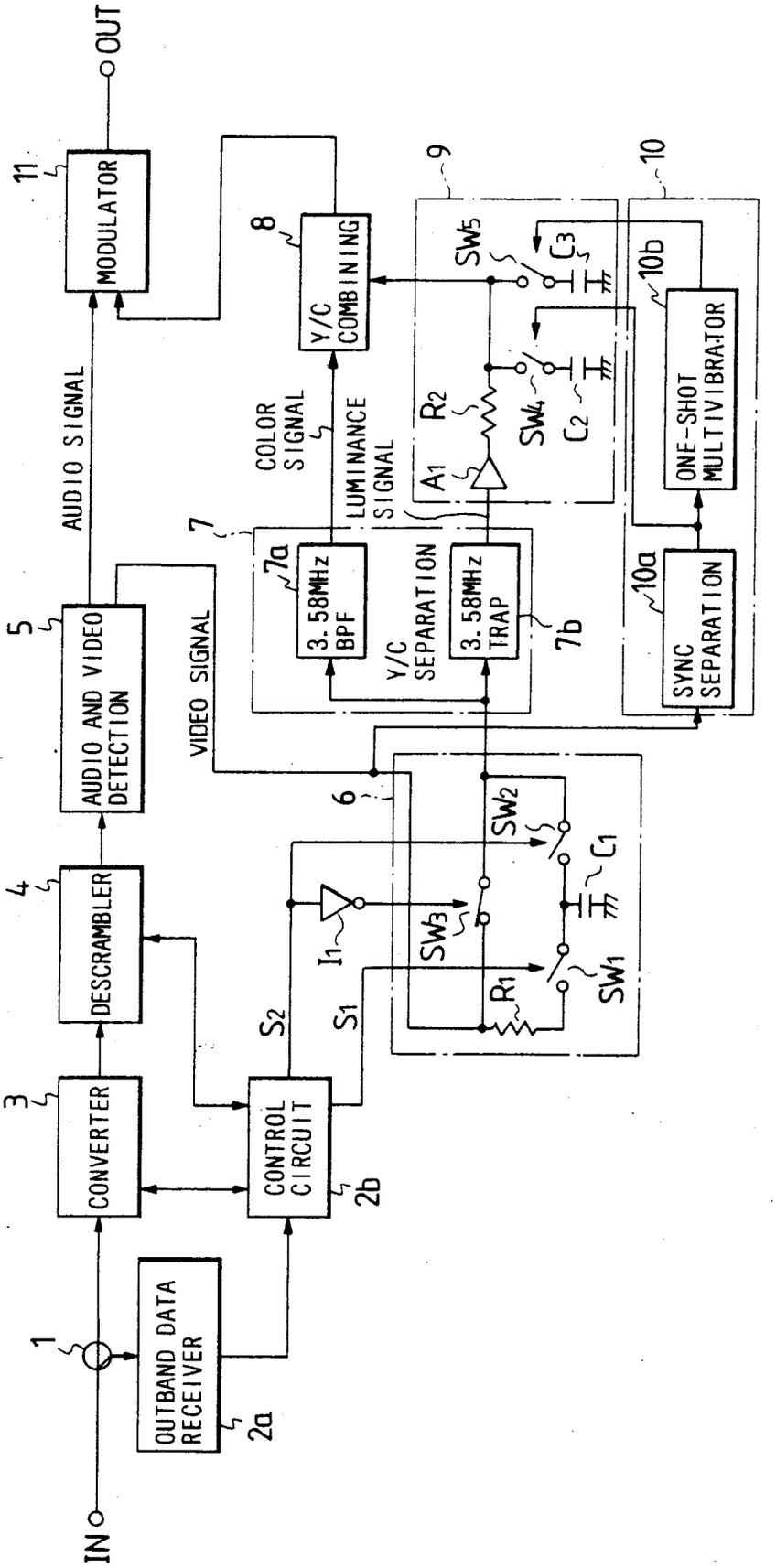

IN
OUT
1
OUTBAND DATA RECEIVER
2a
CONTROL CIRCUIT
2b
CONVERTER
3
DESCRAMBLER
4
AUDIO AND VIDEO DETECTION
5
MODULATOR
11
Y/C COMBINING
8
AUDIO SIGNAL
VIDEO SIGNAL
COLOR SIGNAL
LUMINANCE SIGNAL
7
7a
3.58MHz BPF
7b
3.58MHz TRAP
Y/C SEPARATION
9
10
10a
SYNC SEPARATION
10b
ONE-SHOT MULTIVIBRATOR
6
SW1
SW2
SW3
SW4
SW5
C1
C2
C3
R1
R2
A1
I1
S1
S2

FIG. 10

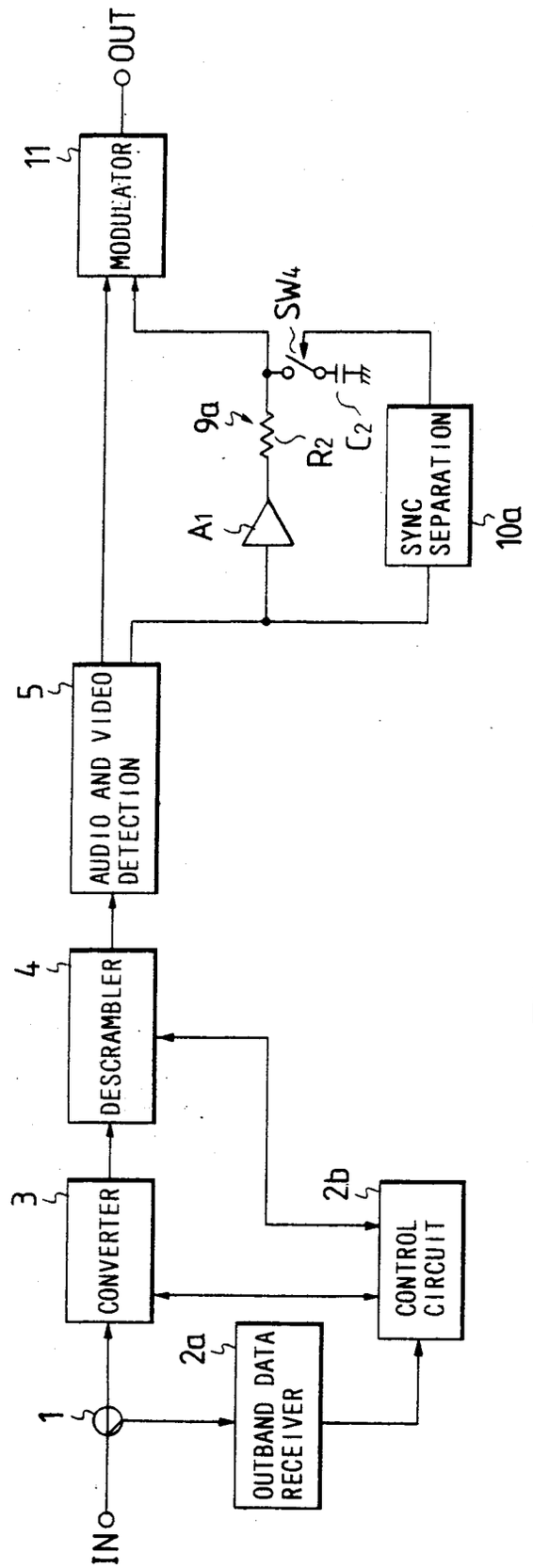

IN
1
OUT
11
MODULATOR
SW4
9a
R2
C2
A1
SYNC SEPARATION
10a
5
AUDIO AND VIDEO DETECTION
4
DESCRAMBLER
3
CONVERTER
2a
OUTBAND DATA RECEIVER
2b
CONTROL CIRCUIT

FIG. 12

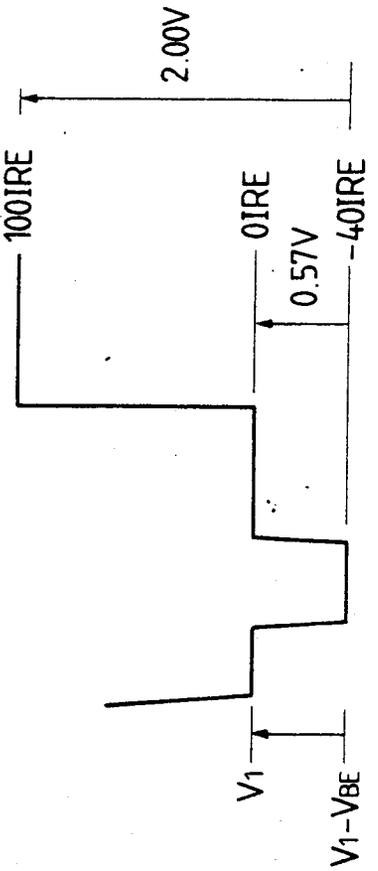

2.00V
100IRE
0IRE
0.57V
-40IRE
V1
V1-VBE

FIG. 11

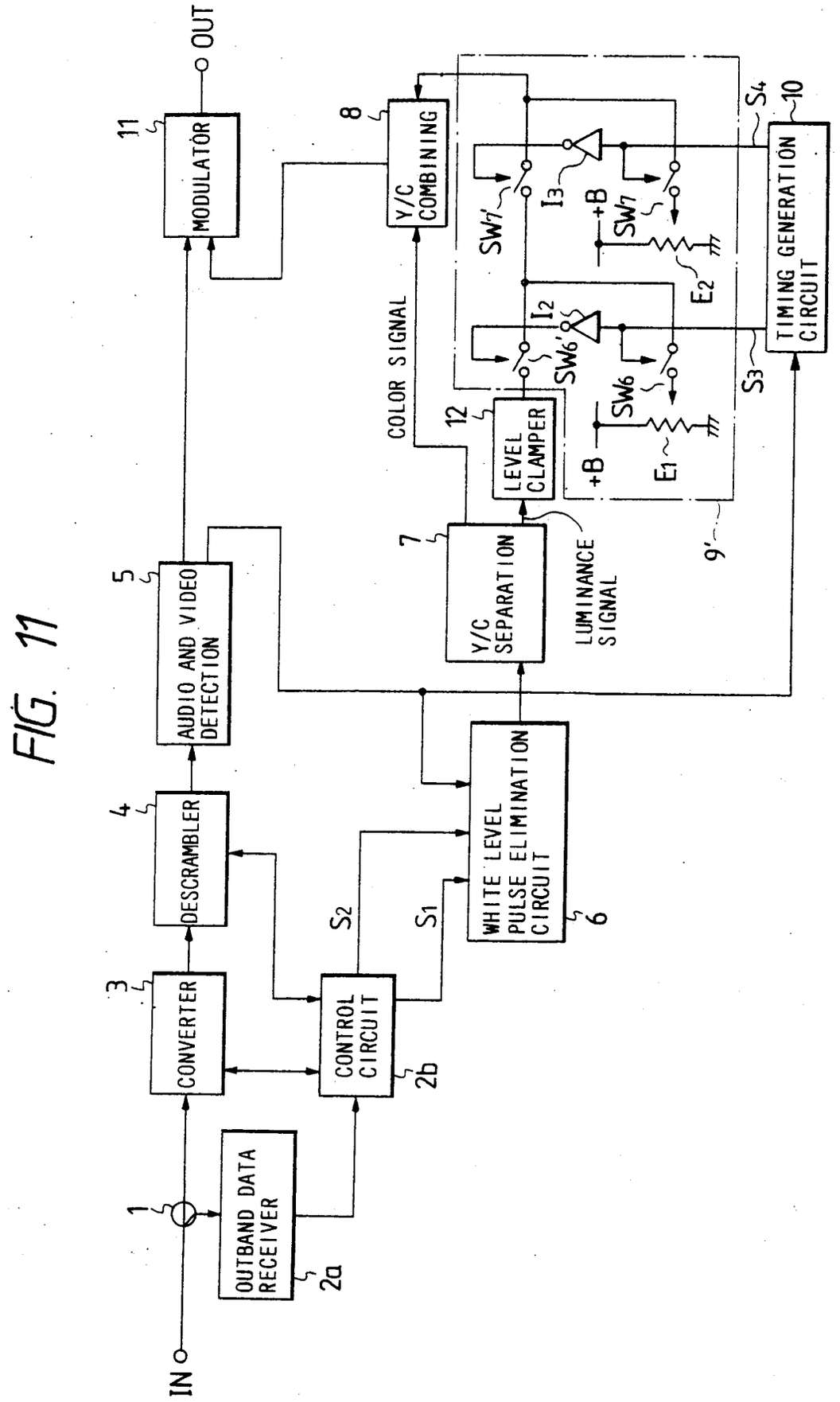

IN
OUT
1
OUTBAND DATA RECEIVER
2a
CONTROL CIRCUIT
2b
CONVERTER
3
DESCRAMBLER
4
AUDIO AND VIDEO DETECTION
5
WHITE LEVEL PULSE ELIMINATION CIRCUIT
6
Y/C SEPARATION
7
Y/C COMBINING
8
MODULATOR
11
LEVEL CLAMPER
12
TIMING GENERATION CIRCUIT
10
S1
S2
S3
S4
COLOR SIGNAL
LUMINANCE SIGNAL
SW7'
SW7
SW6'
SW6
I3
I2
+B
E1
E2
9'

FIG. 13

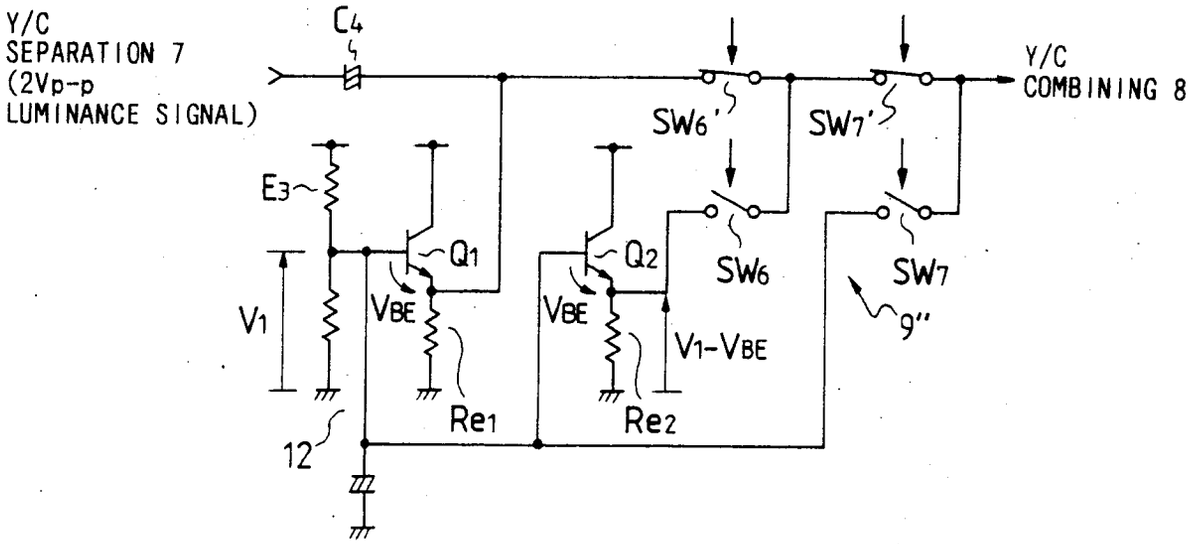

Y/C
SEPARATION 7
(2Vp-p
LUMINANCE SIGNAL)
C4
Y/C
COMBINING 8
SW6'
SW7'
E3
Q1
Q2
SW6
SW7
9"
V1
VBE
VBE
V1-VBE
Re1
Re2
12

FIG. 14

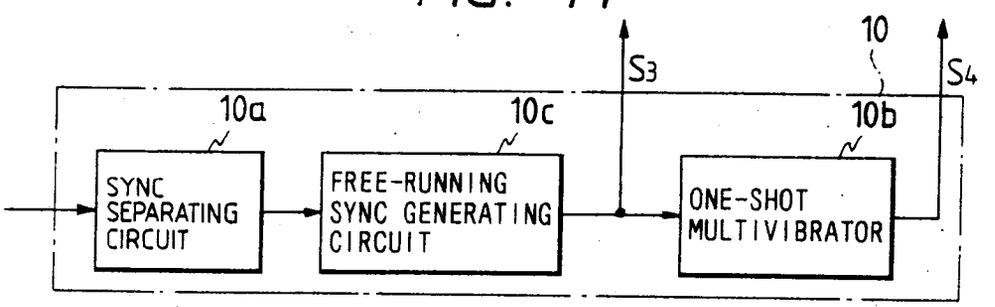

10
S3
S4
10a
10c
10b
SYNC
SEPARATING
CIRCUIT
FREE-RUNNING
SYNC GENERATING
CIRCUIT
ONE-SHOT
MULTIVIBRATOR

FIG. 15

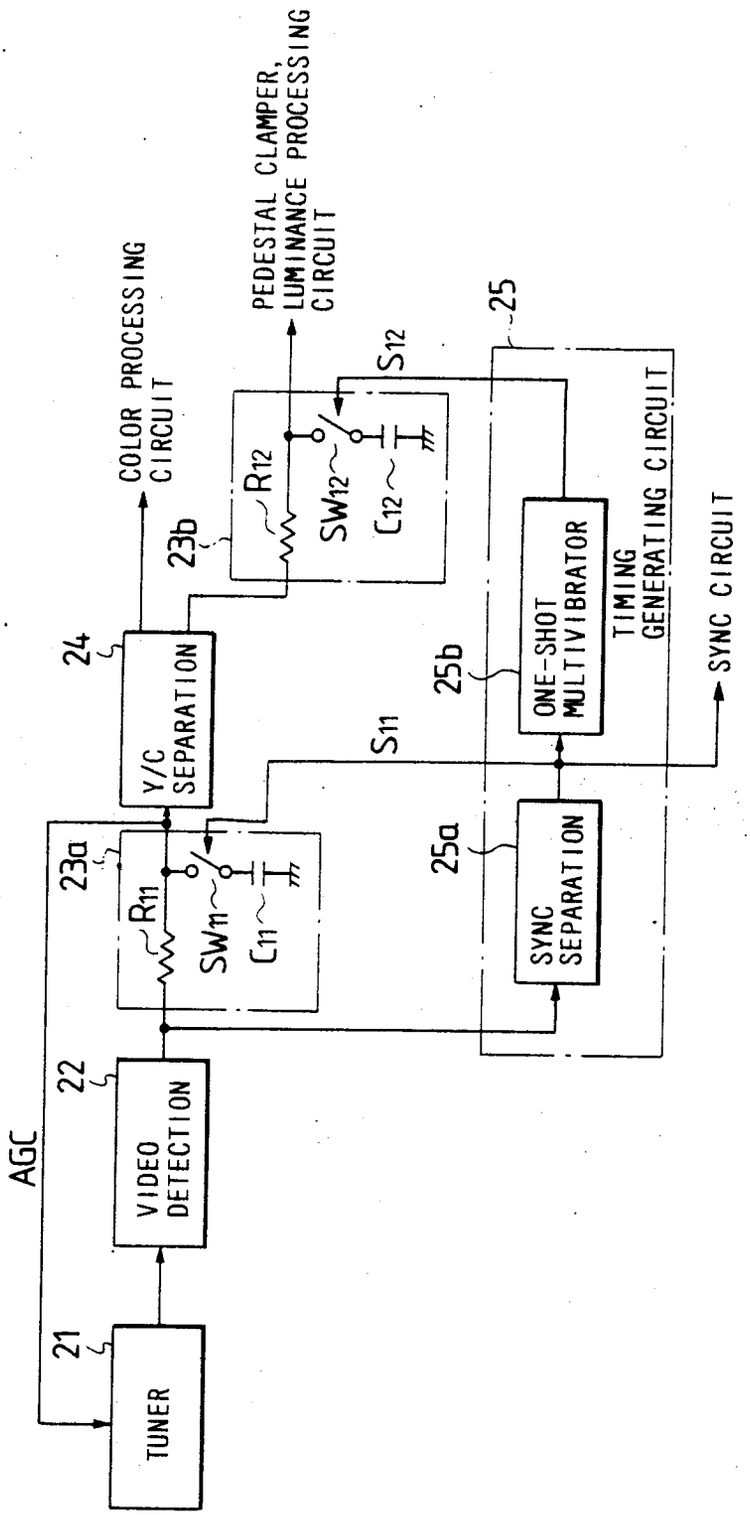
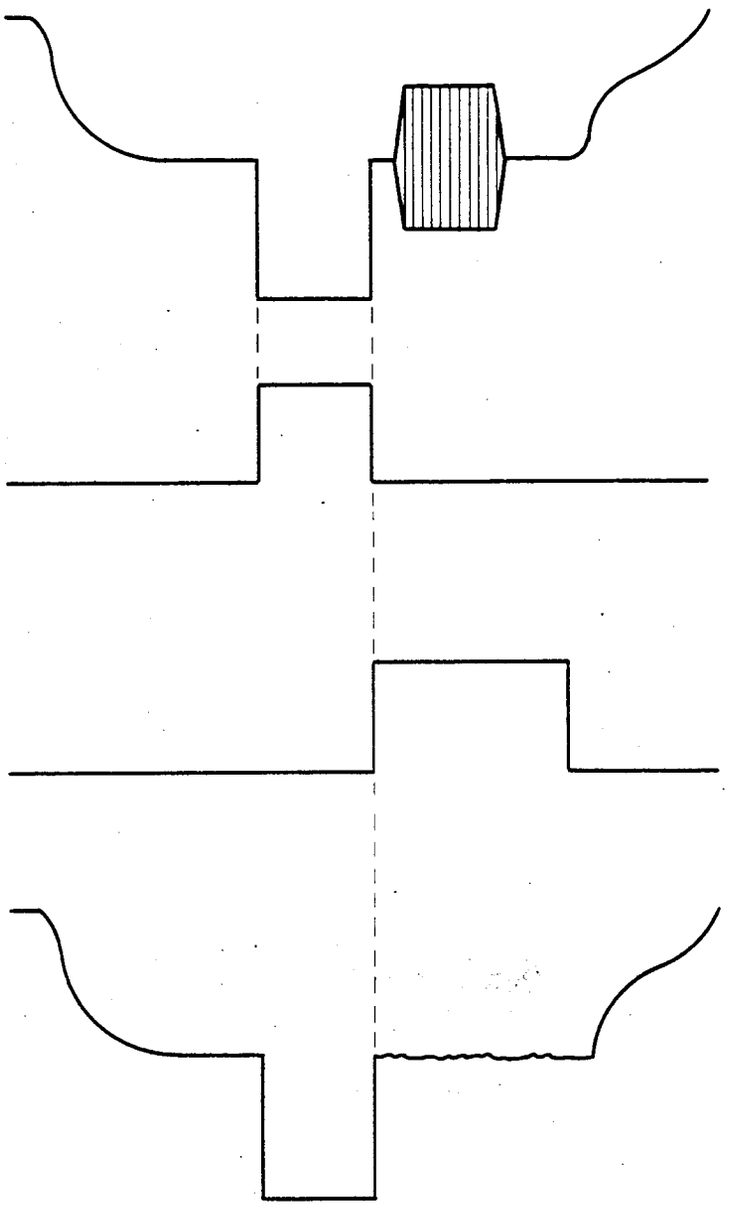

TUNER
21
AGC
VIDEO DETECTION
22
23a
R11
SW11
C11
23b
R12
SW12
C12
S12
PEDESTAL CLAMPER, LUMINANCE PROCESSING CIRCUIT
COLOR PROCESSING CIRCUIT
24
Y/C SEPARATION
S11
25
25a
SYNC SEPARATION
25b
ONE-SHOT MULTIVIBRATOR
TIMING GENERATING CIRCUIT
SYNC CIRCUIT

FIG. 16(a)

FIG. 16(b) S_{11}

FIG. 16(c) S_{12}

FIG. 16(d)



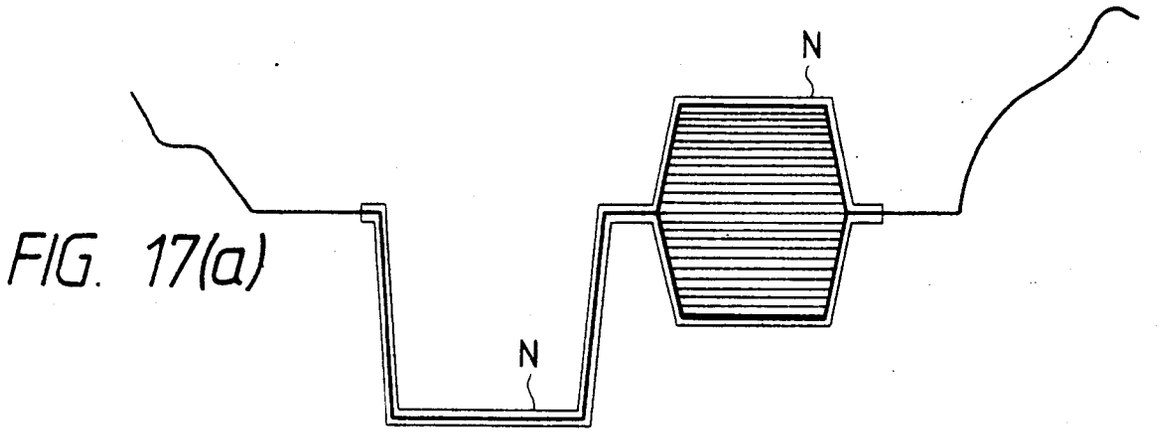


FIG. 17(a)

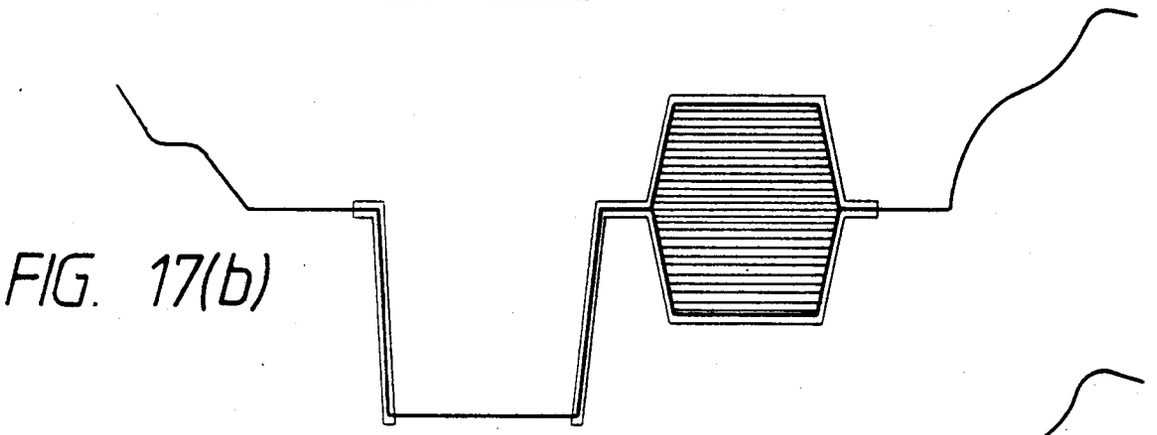


FIG. 17(b)

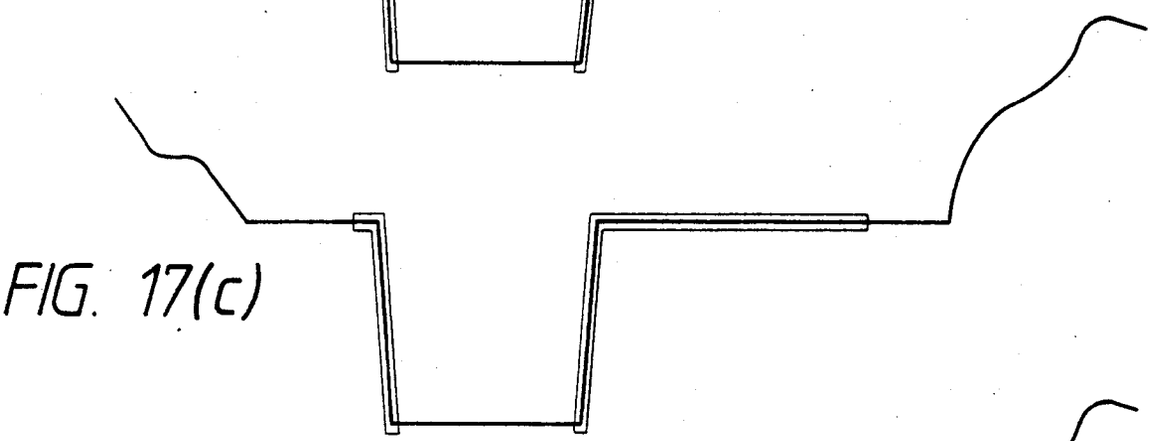


FIG. 17(c)

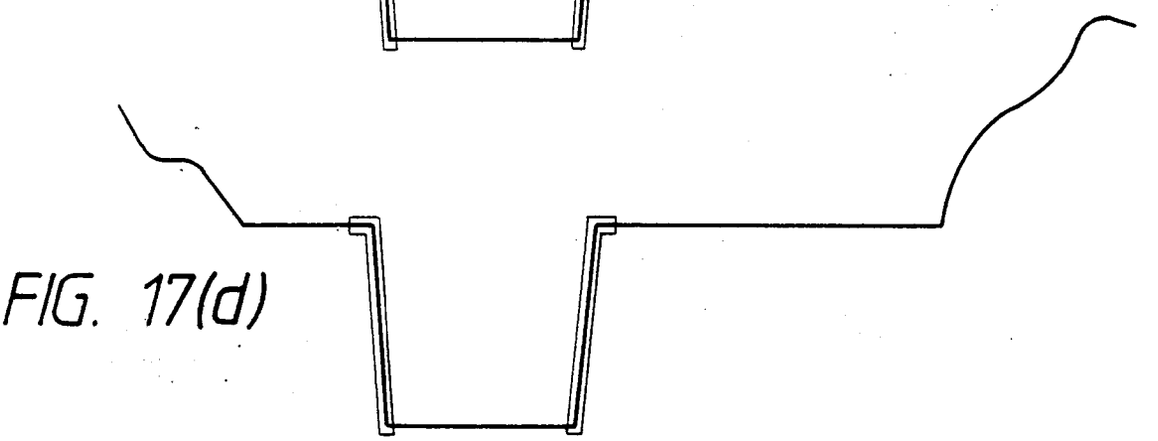


FIG. 17(d)

FIG. 18

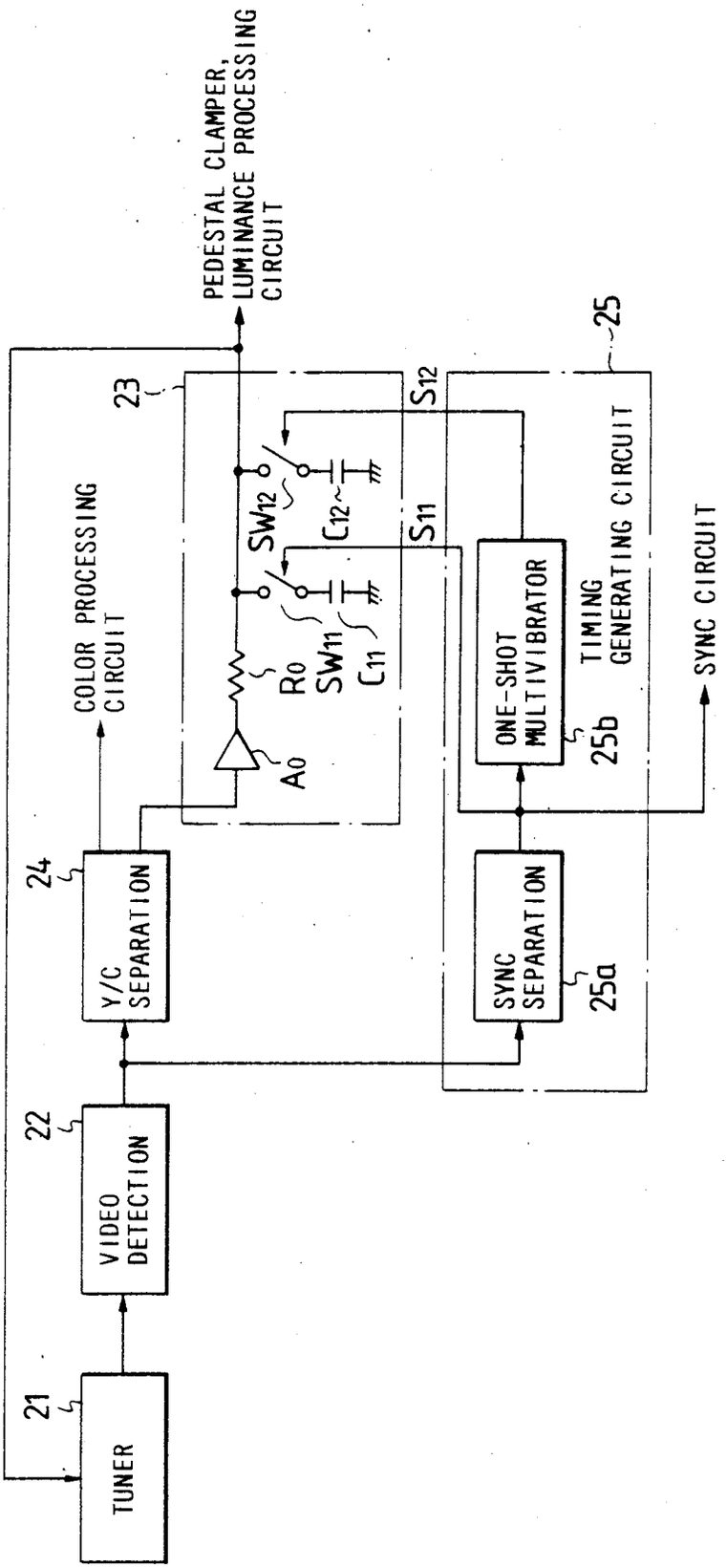

PEDESTAL CLAMPER, LUMINANCE PROCESSING CIRCUIT
COLOR PROCESSING CIRCUIT
SYNC CIRCUIT
TUNER
VIDEO DETECTION
Y/C SEPARATION
SYNC SEPARATION
ONE-SHOT MULTIVIBRATOR
TIMING GENERATING CIRCUIT
21
22
23
24
25
25a
25b
A0
R0
SW11
SW12
C11
C12
S11
S12

FIG. 19

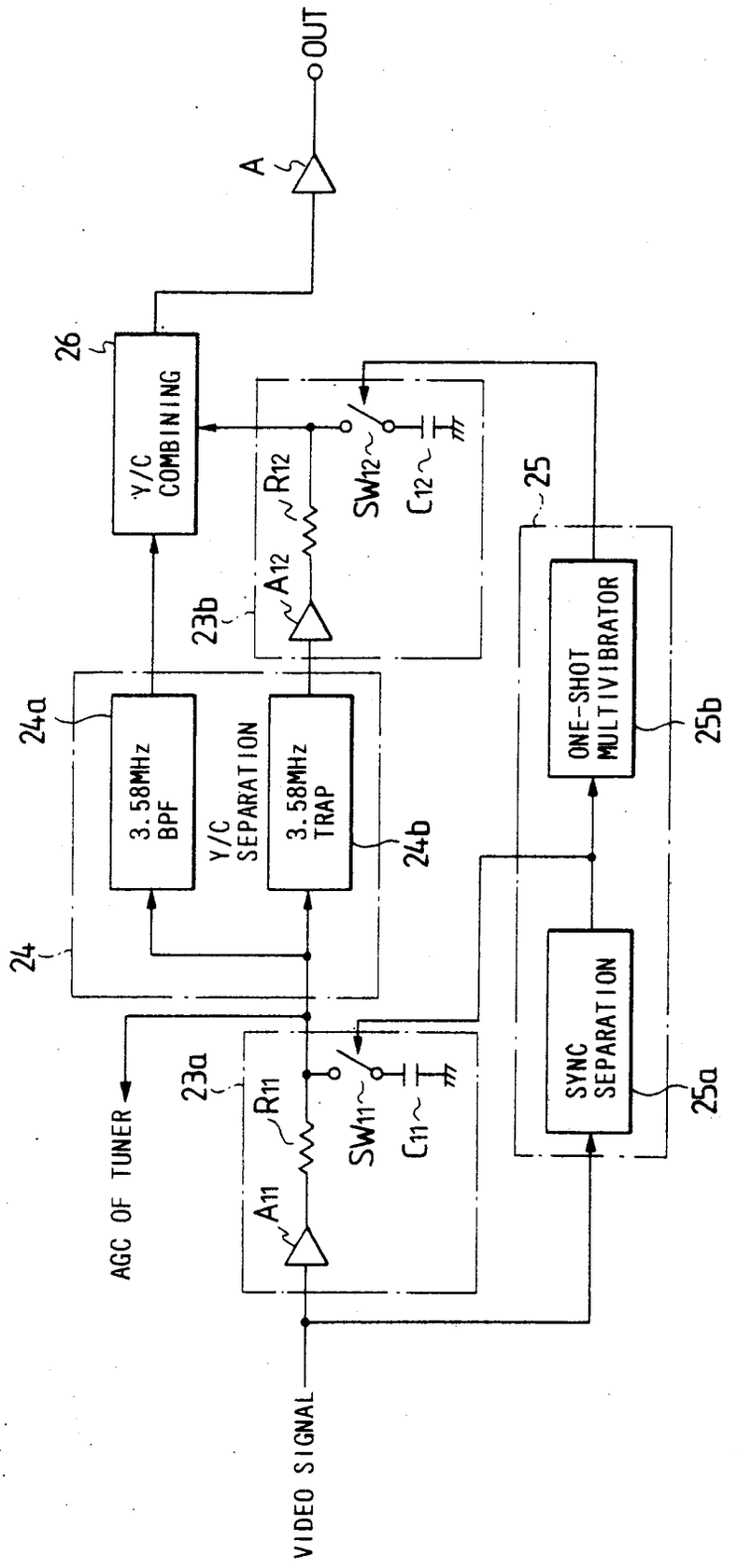

OUT
A
26
Y/C COMBINING
R12
SW12
C12
25
A12
23b
24a
3.58MHz BPF
Y/C SEPARATION
3.58MHz TRAP
24b
ONE-SHOT MULTIVIBRATOR
25b
24
23a
R11
SW11
C11
SYNC SEPARATION
25a
A11
AGC OF TUNER
VIDEO SIGNAL

FIG. 20

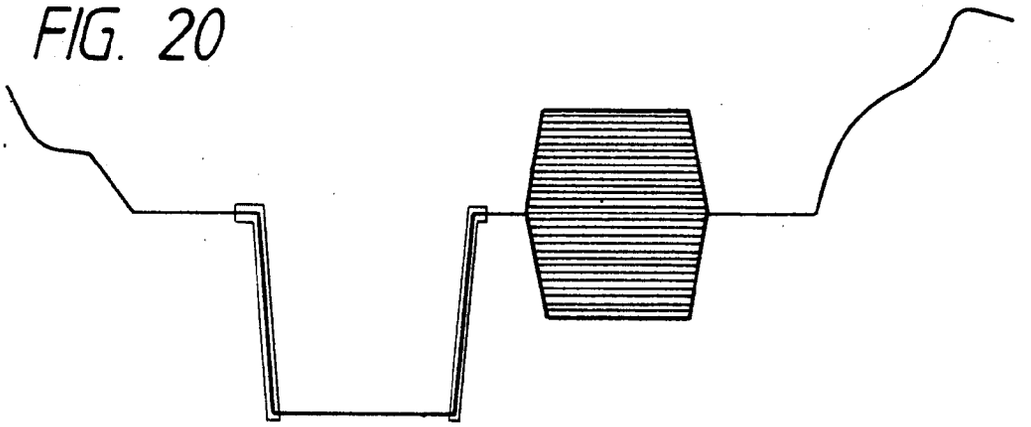


FIG. 23

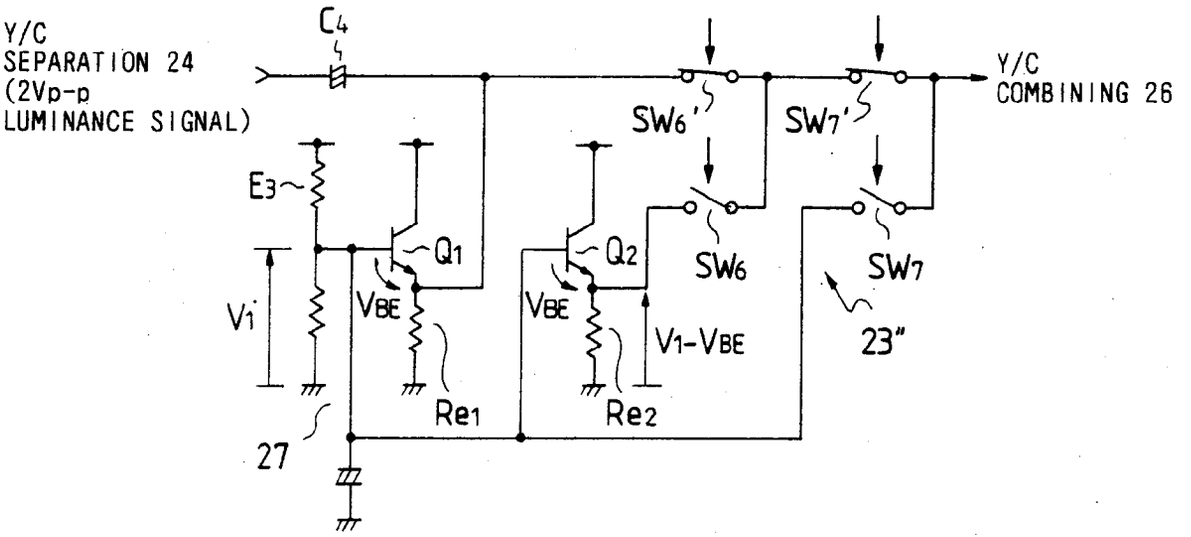


FIG. 24

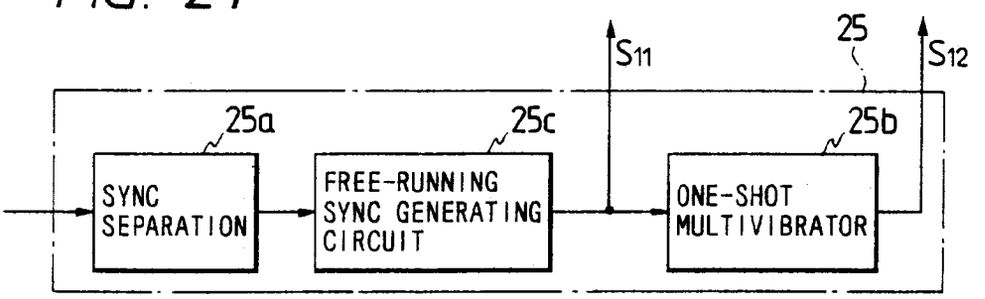


FIG. 21

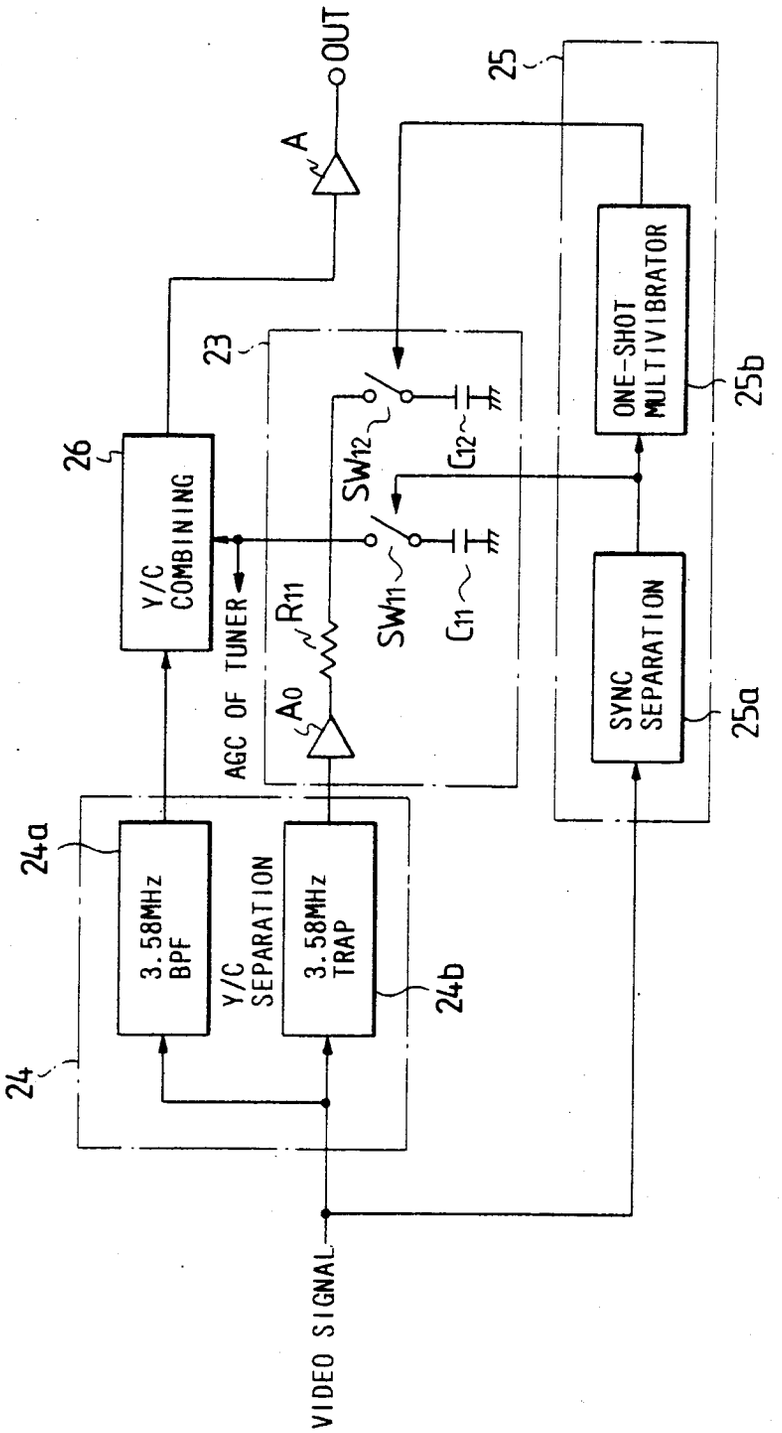
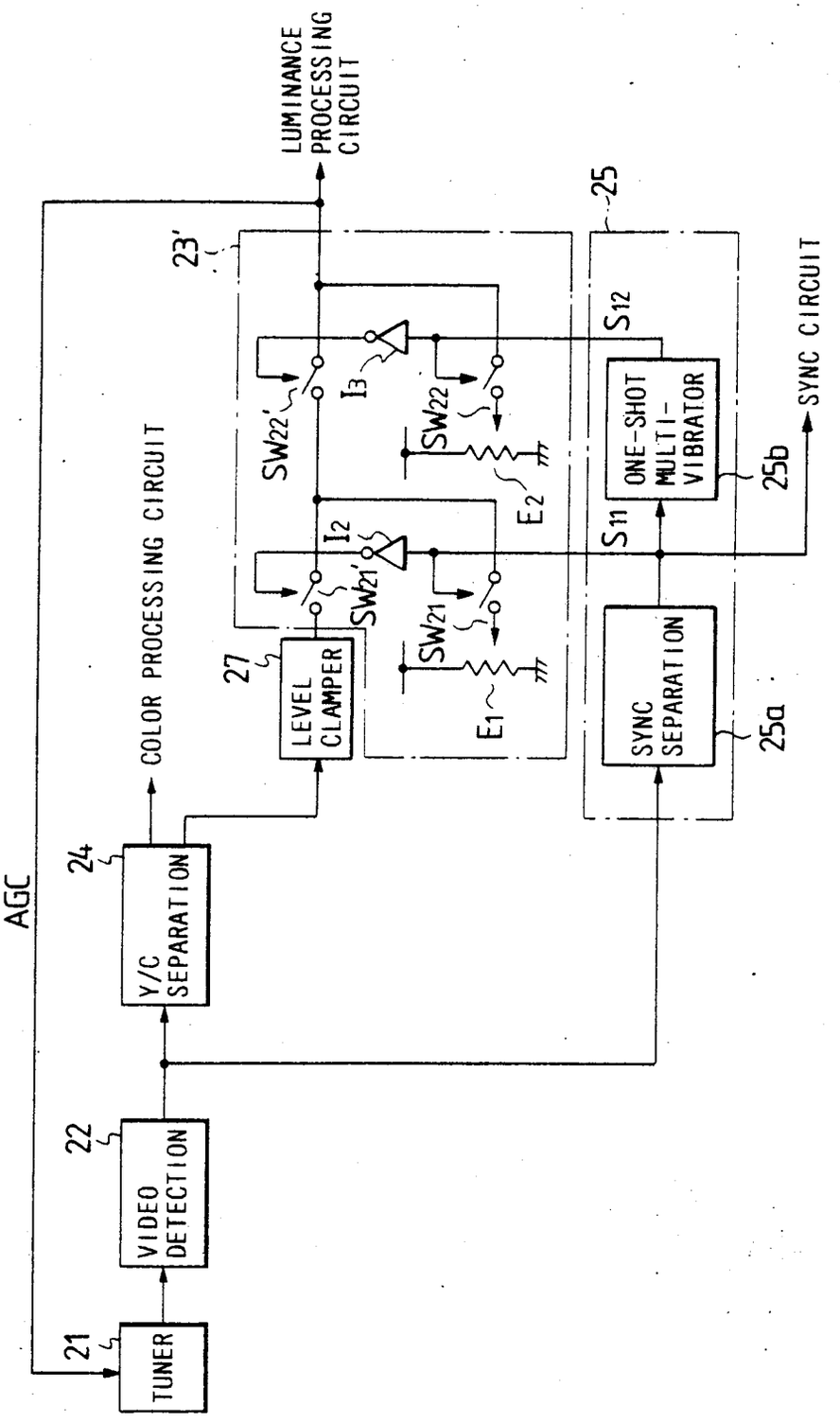

VIDEO SIGNAL
24
24a
3.58MHz BPF
Y/C SEPARATION
3.58MHz TRAP
24b
AGC OF TUNER
A0
R11
SW11
C11
SW12
C12
23
26
Y/C COMBINING
A
OUT
25
ONE-SHOT MULTIVIBRATOR
25b
SYNC SEPARATION
25a

FIG. 22


LUMINANCE PROCESSING CIRCUIT
23'
25
S12
SW22'
I3
SW22
E2
ONE-SHOT MULTI-VIBRATOR
25b
SYNC CIRCUIT
S11
I2
SW21'
SW21
E1
27
LEVEL CLAMPER
SYNC SEPARATION
25a
COLOR PROCESSING CIRCUIT
24
Y/C SEPARATION
AGC
22
VIDEO DETECTION
21
TUNER